American Machinist

Volume 57 NEW YORK, DECEMBER 21, 1922 Number 25

Making Steel Balls

Description of Methods Used by the Atlas Ball Company to Produce Steel Balls—Methods Rather than Skill Produce Desired High Quality

By A. L. De LEEUW
Consulting Editor, *American Machinist*

TO MAKE A STEEL ball which must be so round that the most refined machine shop methods will not be sufficient to discover a deviation from the ideal, which must be made to a given diameter and shall not be more than $\frac{1}{10}$ of a thousandth of an inch oversize or undersize; which must be of extraordinary hardness throughout and which must be finished to such a high degree of polish and perfection that a strong magnifying glass shall not disclose the minutest impression or scratch, would seem quite a task. If such a feat had been accomplished, say 100 years ago, volumes would have been written about so remarkable an accomplishment. To make thousands of such balls, all alike and all of the same degree of perfection would seem to border on the impossible and yet this is the daily task of the Atlas Ball Company of Philadelphia, Pa.

FIG. 1—INSPECTING STEEL BALLS

We are so familiar with steel balls and their use that we fail to appreciate the remarkable qualities they must possess. Like many other things which we meet daily, we take them for granted. Perhaps the most important lesson we can learn when we follow the manufacture of steel balls is, that method and system are of more importance than individual skill and that they can accomplish things which are beyond the ability of an individual. One hundred years ago it would have required a super-mechanic to make only one ball and it is highly improbable that he would have succeeded. Now millions of balls are made, not by skill, not by supermechanics, but by application of the proper methods and the proper system.

The ordinary method of describing the manufacture of a product is to begin with the material. We propose to reverse this process because what the observer is interested in is the finished ball and probably the first question he will ask himself is: How is it possible that one can be sure that the balls are made to the proper diameter and all alike, if their allowable variations are so exceedingly small? And so we will begin with the inspection.

The girl, shown in Fig. 1, is engaged in the task of inspecting the finished balls. It will be noted that she wears gloves. After the balls have been polished it is not permitted to touch them by hand because, though they may be oiled, the touch of the finger will cause them to corrode, not immediately but some time later.

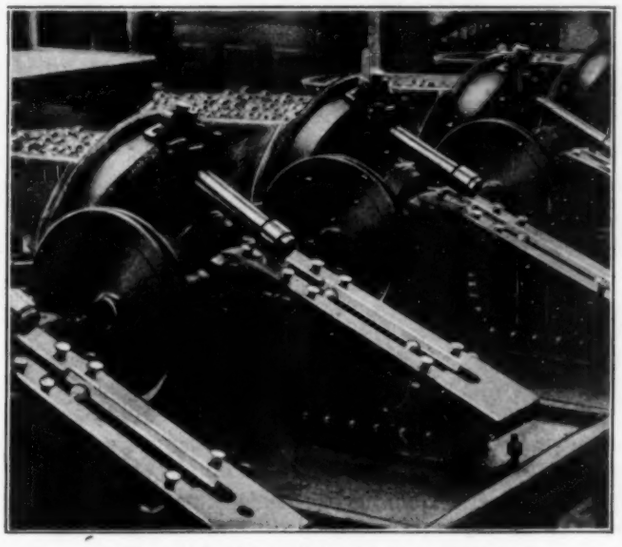


FIG. 2—MECHANICAL GAGING DEVICE

The balls to be inspected are laid on a slightly inclined desk so that a white cardboard placed at the end will throw a bright reflection of light on the balls causing them to appear partly a bright white and partly dark. That portion which is turned toward the card board appears white.

The inspector has another piece of cardboard in her hand which she inserts under the balls causing them to turn. She is constantly moving them so as to expose new parts of their surfaces to the bright reflection. The minutest scratch can be discovered in this manner. Sometimes there is a de-carbonized spot in the ball, a

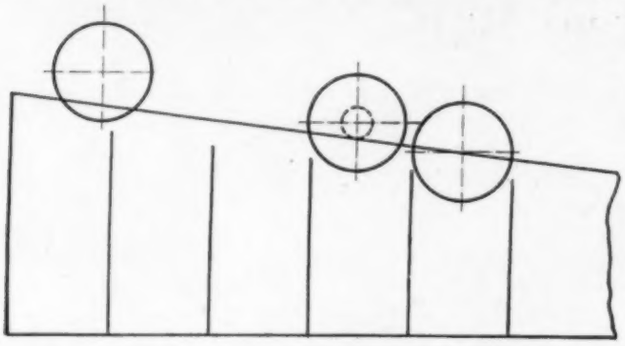


FIG. 3—DIAGRAM SHOWING ACTION OF BALLS, ROLLING DOWN THE INCLINED PLANE OF THE GAGING DEVICE

spot which is not quite so hard as the rest of it. Such a spot appears like a faint cloud. Balls which are not perfect are removed by means of a pencil-like magnet, which the inspector holds in her right hand. When inspecting the smaller balls, she holds a small chamois bag in her hand into which she drops the imperfect balls

It is interesting to watch how the little magnet is manoeuvred. The ball is picked up at one end and lifted

FIG. 4—TESTING STANDARD BALLS BY THE MINIMETER

by the magnet. Holding the pencil at a certain angle, the ball is made to slide along the magnet until it reaches the non-magnetic center when it drops into the open chamois bag. The entire operation goes very quickly. And, by the way, the upright pieces of cardboard are of such a size, and are so placed that the exhaled breath is deflected toward the operator, thus guarding the balls against corrosion.

The balls which are found to be imperfect on inspection may have different degrees of imperfection. There may be a single very small scratch or impression which, of course, makes the ball unfit for this particular size but allows it to be repolished for a somewhat smaller size. It should be remembered that balls are ordered not merely of standard size, such as for instance $\frac{3}{4}$ in., but that they are often required to be, let us say, $\frac{3}{4}$ in. plus 0.001, or maybe minus 0.001 in. When the imperfection is slightly deeper grinding may take it out. Whatever is done later on with the imperfect balls they are always followed up as "imperfects" and if it is found that a second grinding does not remove the imperfection, the ball is scrapped.

There are some balls which are merely unsuited for the particular size for which they were intended, others have real defects and must be scrapped. It is for this reason that the inspector is provided with a tray with a number of partitions in which the different kinds of imperfect balls are placed after inspection.

Before the final inspection the balls are measured. All Atlas balls are guaranteed to be not more than 0.00005 in. above or below the desired size. When speaking of the amount of finish left for a certain operation or of the amount of tolerance, the Atlas people speak in tenths of a thousandth so that when they say that a ball should be 20 over-size, it merely means that it should be 0.002 in. larger than the nearest standard size.

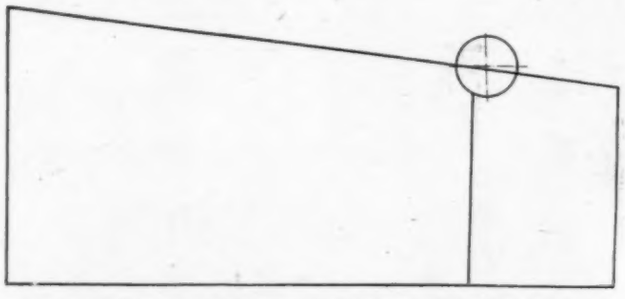


FIG. 5—DIAGRAM SHOWING PRINCIPLE OF GAGING DEVICE AS USED BY THE ATLAS BALL CO.

A common way of sorting balls is to let them run over an inclined plane such as shown in Fig. 2. The plane is made by two beveled straight edges which are set at a slight angle so that the opening at the top is somewhat less than that at the bottom. In some factories balls varying as much as 0.001 are inspected that way and the space under the straight edges is provided with 10 divisions so that if, for instance you were inspecting half-inch balls, a ball of 0.4995 in. would drop at the top of the inclined plane in a compartment; another one which would be exactly $\frac{1}{2}$ in. would drop in the 6th compartment, whereas one of 0.5004 in. diameter would drop in compartment 10. In this manner, it is supposed that the balls in each compartment are of the same nominal diameter and perfectly to size within $\frac{1}{10}$ of a thousandth. This method, however, is not sufficiently refined to be absolutely sure about the correctness of size.

In Fig. 3 the action of the inclined plane is shown in diagrammatic form. When the ball is resting on the inclined plane somewhere near the top, its center is quite some distance above the incline; when it has come to the last compartment, that is, the one in which it will drop, its center is exactly on the incline. On the last but one, the center of the ball is so near the incline that the ball while rolling down turns on an exceedingly small diameter. The small circle shown is the one on which it turns.

We see then that the ball has considerable speed at the upper part of the incline and that, though it has been rolling for some time and might be supposed to have gathered speed, yet it will have exceedingly low speed when it is about to drop through the slot. It is therefore likely that great accuracy will be obtained at the lower end of the inclined plane but that the speed at the upper part is too great to be sure as to the exact compartment in which the ball will drop. Besides, to work correctly, the two straight edges must be very straight, something which is not easy to get or to maintain.

The Atlas Company, realizing these conditions, does not attempt to separate the balls into 10 different sizes. The company starts out by making the balls so nearly correct that the only thing necessary is to apply the "go" and "no-go" gage, in other words, to eliminate those balls which are either too large or too small. For this purpose the inclined plane or rather the two straight edges are set again at a slight taper but there is only one up-right in the box below, thus making two compartments. When setting the testing apparatus a standard ball is used which, before using, is compared by the chief inspector with Johansson blocks.

Figure 4 shows the action of testing a standard ball. The minimeter used for this purpose will indicate accurately to a 40th of one thousandth, that is to say, it compares to that limit though it does not measure. Johansson blocks are piled up to the correct size and the minimeter is set so that the hand points to 0. A magnifying glass in front of the dial of the minimeter makes it possible to make this setting very accurate. The standard ball is compared with this minimeter setting and if the result is satisfactory the ball is used for the setting of the straight edges of the inclined plane.

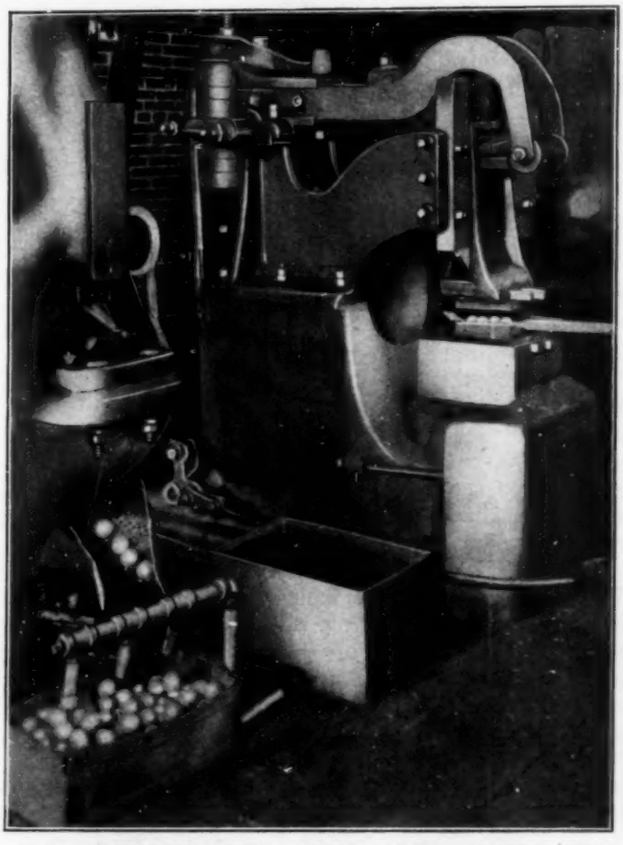


FIG. 6—FORGING STEEL BALLS. ALSO SHOWING HOT PRESSED BALLS COMING FROM THE PRESS AND COOLING DEVICE

In Fig. 5 the inclined plane is once more shown in diagram. This time it is arranged as the Atlas Company arranges the device, that is, with only one partition. The straight edges are set so that the standard ball will drop to the right of the partition. The setting is made so accurate that a ball of the correct size will fall and strike the partition as is shown in the illustration. The vertical center line of the ball is slightly to the right of the partition.

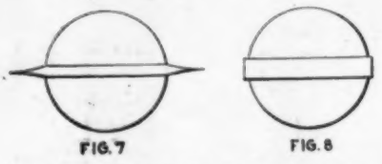


FIG. 7—DIAGRAM SHOWING NATURE OF FIN PRODUCED BY COLD PRESSING. FIG. 8—DIAGRAM SHOWING HOW FIN IS CHANGED BY ROLLING BETWEEN HARDENED PLATES

Should a ball be ever so little too small it will drop to the left of the partition. In either case, its speed before dropping is very small. With this arrangement of the straight edges it is unimportant whether these straight edges are really straight or not so long as there is only one point at which the standard ball will drop.

As a matter of fact, the balls used for setting the machine are not the standard size but the maximum and minimum allowable sizes. As Fig. 5 is arranged, the minimum size ball has been used so that all balls dropping to the right of the partition are above the minimum whereas all balls dropping to the left would be below the minimum and should be rejected.

After the balls have been gaged in this manner they are once more run over the inclined plane, this time set for maximum so that all balls dropping to the left of the partition are below the maximum while those dropping to the right are above the maximum and are therefore rejected. At the end of the two inspections we have balls which are above the minimum and below the maximum and therefore correct. In reality, two gaging machines are set up at the same time, one for "go" and the other for "no-go." As we have seen how inspection takes care of size and quality we will show now how this quality is obtained.

Sizes of Balls Made

The balls made by the Atlas Company range regularly from $\frac{1}{8}$ in. to $2\frac{1}{2}$ in. Larger balls are also made but not as a regular product. Such a wide range of sizes requires, of course, different methods of manufacture. It is rather remarkable, considering the wide range of sizes that in the main the same methods are used, there being certain differences only in the first operations.

The smaller balls up to $\frac{5}{8}$ in. are cold pressed. Larger ones up to $1\frac{1}{4}$ in. are hot pressed and still larger sizes are forged. A number of balls are forged at the same time under the Bradley hammer. This operation is shown in Fig. 6 and needs no further explanation. In the foreground a press for hot pressing is shown and 4 balls are rolling along a sheet toward the box in which they are received. It will be noticed that a pipe is arranged over this box. This is a compressed air pipe which assists in cooling the balls.

The cold pressing of the smaller balls is done on a rivet machine and offers no difficulties except that it is necessary to cut the slug closely to size so as to avoid

excessive fin. Such a fin extends around the ball as a thin sheet, shown in a somewhat exaggerated form in Fig. 7. Though the amount of metal in the fin is very small its shape would cause trouble when these balls are placed in the grinding machine. For this reason they are sent through a machine where they are rolled between hardened plates which changes the fin over to a form as indicated in Fig. 8. Though there is

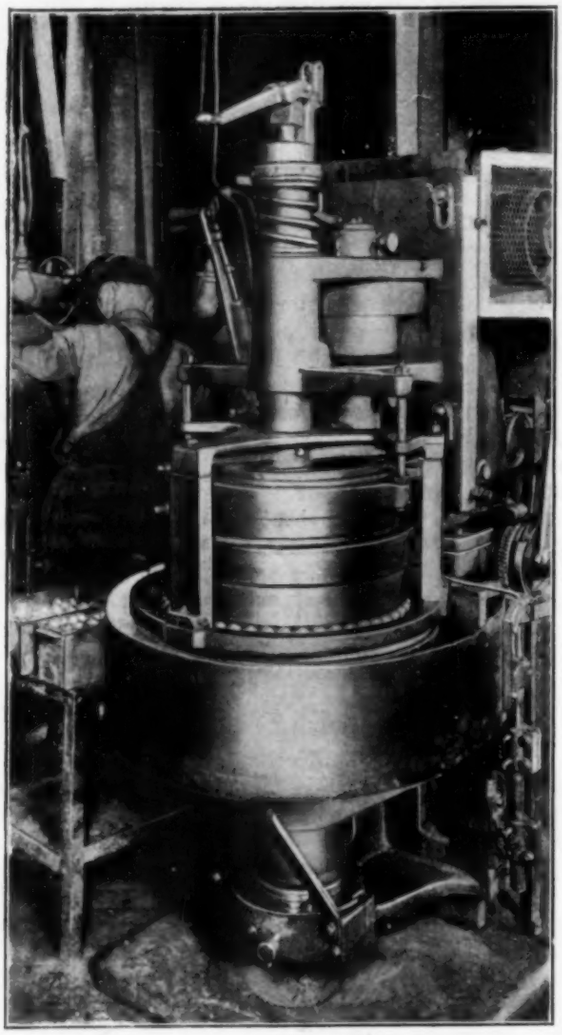


FIG. 9—ROUGH GRINDING MACHINE (VERTICAL)

almost as much metal in this fin as there was before, it no longer causes trouble when grinding.

Such fins are not produced by hot pressing or forging. When hot pressing, the heated slug drops automatically from the furnace on to a plate where it is gripped by a pair of fingers and brought in position, after which the fingers retreat just before the upper die comes down. The fin caused by this operation is very small and does not need to be removed. Neither is there a fin when the balls are forged. In that case there is merely a small projection left at the point where the balls are separated. Figure 6 shows how a number of balls are forged at the same time.

The material used for the smaller balls, that is, for those which are cold pressed, is cold drawn wire. The length of the slug is about 1½ times the diameter of the wire. From this the correct diameter for each size ball can be easily calculated. The wire may be 0.002 in. over-size or under-size. The hot pressed balls are made of cold drawn rods which are allowed the same variation from standard, while the material for the forged balls is hot rolled bars with 0.005 in. permissible variation below and 0.009 in. above standard size.

The operations vary to a certain extent according to whether the balls are made of cold pressed or hot pressed and forged material. In the latter case the following list of operations obtains:

First operation — Annealing
Second operation — Rough grinding
Third operation — Hardening
Fourth operation — Rough grinding
Fifth operation — Oil lapping
Sixth operation — Hoffman grinding
Seventh operation — Polishing
Eighth operation — Finish polishing, after which the operations are measuring and inspection as heretofore described.

In the case of small balls, the operations are as follows:

First operation — Rough grinding.
Second operation — Annealing
Third operation — Hoffman grinding in the soft state
Fourth operation — Hardening
Fifth operation — Hoffman grinding—hard
Sixth and Seventh — Rough and fiinish polishing

Allowance for Finish

The amount allowed for finish on the larger balls is 0.050 in. The rough grinding brings them down to about 0.014 in. over-size. The second rough grinding, after hardening, reduces that to 0.008 in. over-size, the oil lapping to 0.0025 in. and the Hoffman machine to 0.0002 in. over-size so that the rough and finish polishing removes $\frac{1}{10}$ of a thousandth regardless of the size of the ball.

In case of the smaller balls the amount allowed for finish is 0.020 in. The first rough grinding when soft, reduces this allowance to 0.012 in. The second grinding, still soft and which is done on the Hoffman machine, reduces this to 0.005 in. over-size. The final grinding, after hardening, also on the Hoffman machine, brings the balls down to 0.0002 in. over-size just as with the larger balls.

Figure 9 shows a vertical rough grinding machine which consists of an upper and a lower spindle, both rotating and *not* in line with each other. The upper spindle carries a disk with a number of concentric V-grooves in which the balls are located. The lower spindle carries a grinding wheel. The eccentricity is such that every part of the rim of the cup-shaped grinding wheel comes in action so that the balls cannot have a tendency to produce grooves in the wheel. The grinding is done dry as it was found that wet grinding was not satisfactory. It will be noticed that the upper spindle is forced down. The amount of pressure, however, is not very great, being about 70 lb. to 100 lb. in all. The rotation of the two members causes the balls to travel in the grooves and the eccentricity of the grinding wheel in relation to the upper member causes the balls also to turn in the direction of the radius of the upper member so that every point of the ball is at some time exposed to the action of the grinding wheel.

When these balls come out of the machine they show a large number of small facets with parallel grinding scratches.

(To be concluded next week.)

Details of Diamond Boring Tools

Recommended Sizes of Boring Bar—Angle for Setting of Tools—Methods of Sharpening—Kind of Diamonds and How They Are Inserted in Tools

BY G. T. LINTING

THE SUCCESS of any diamond boring tool depends quite largely on whether the boring bar which carries the tool is as close a fit in its guide bushings as possible. The boring bars should be as large in diameter as possible, and should be provided with the hardened wearing strips shown in Fig. 1. These strips fit hardened steel bushings in the boring fixture as tightly as possible, and still turn without galling the bar or bushings. The bar itself is left soft.

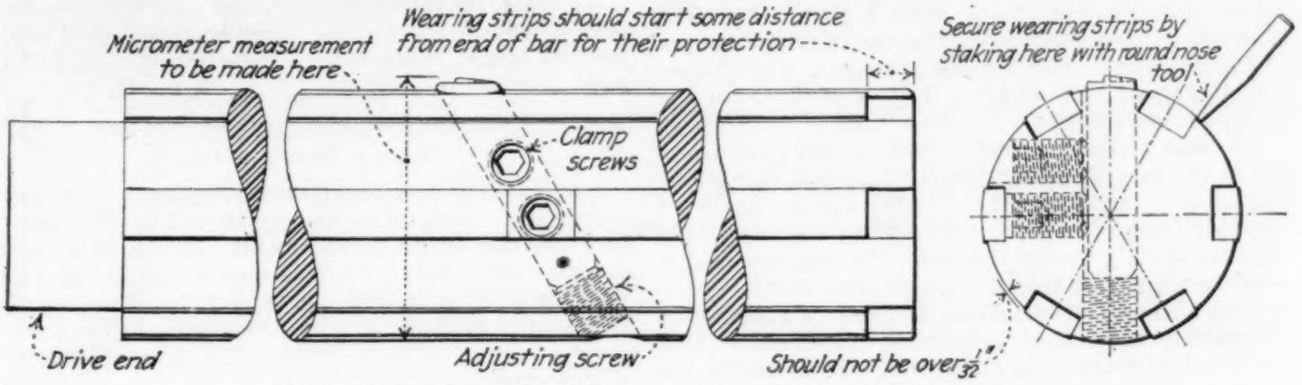

Micrometer measurement to be made here
Wearing strips should start some distance from end of bar for their protection
Clamp screws
Drive end
Adjusting screw
Should not be over 1/32"
Secure wearing strips by staking here with round nose tool

FIG. 1—BORING BAR WITH DIAMOND AND WEARING STRIPS IN PLACE

These hard wear strips in the bar have a certain purpose. After the strips have been worn undersize so that they do not fit the bushings, the bar can be restored by either inserting new strips or shimming up the original strips and then regrinding the bar to fit the bushings. Should these strips by chance become galled in the bushings the bar can be restored to its original size by the method just described. The method of inserting the wear strips in the bar is as follows: Four or six grooves, depending on the size of the bar, are milled the entire length of the bar to within some few inches on the driving end. The strips may be from $\frac{1}{4}$ to $\frac{1}{2}$ in. thick and from $\frac{1}{2}$ to 1 in. wide and any length that can be conveniently carbonized and hardened. Any stock that will carbonize and harden may be used. The strips are hardened before they are forced into the bar, the edges having been previously milled to a light drive fit in the slots in the boring bar. The strips are forced into the slots and then staked in tight along the sides, as shown in Fig. 1. Screws are not needed to hold them in place. After the strips have been forced into the bar they are then ground so that they will fit the bushing in the jig.

The holes for carrying the diamond and steel tools are drilled and tapped for holding the tools firmly in place, as well as for adjustment. The tools are set at an angle other than a right angle to the axis of the boring bar, so that the tools can be measured with a micrometer over the edge of the tool and the bar. This setting is also employed in order that a longer tool many be used and may be more firmly held in the bar. The particular angle at which the tool is set is of no importance so long as its setting can be measured over the bar, as the left view in Fig. 1 indicates.

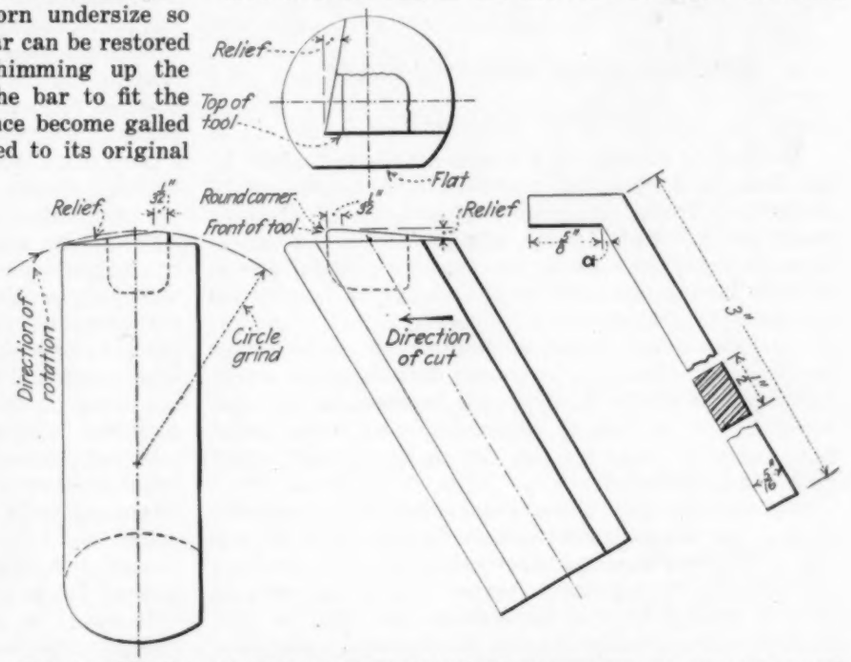


FIG. 2—DETAILS OF SHANK WITH DIAMOND FASTENED TO IT AND GAGE FOR CHECKING RELIEF AND ANGLE

The diamonds used for boring tools should be the finest quality of Brazilian Carbonado. Although they are the kind used for rock drills, they should be selected for a fineness of texture and for freedom from cracks or irregularities in formation. The diamond is first roughly lapped to a cutting edge then fastened in the

This article supplements "Using Diamond Tools in Motor Building" by the same author, published on page 437 of *American Machinist*. The additional data have been furnished at the request of the editors of *American Machinist*.

bottom of a metal mold with brass wire. The mold is then filled with a molten metal, an alloy which has a melting point of about 2,000 deg. Fahrenheit. Fig. 2 gives the details of the shank and the diamond attached to it, as well as the details of a gage for checking the relief and angle.

After cooling, the shank in which the diamond is now firmly embedded is removed from the mold turned to the size desired which is usually from ⅜ to ½ in. in diameter and from 1 to 3 in. long. It is put in a dummy bar which has a hole drilled in it at the same angle as the boring bar and of a size to fit the shank. The diamond is then circle ground to a radius shorter than the radius of the hole which it is to bore, and is backed off the same as any fluted cutter leaving about a ⅛-in. land. The diamond is then relieved at the heel leaving about a ⅛-in. land parallel with the axis of the bar. A small steel wheel charged with diamond dust is used for all the grinding operations.

The face of the diamond is then ground perpendicular to the axis of the bar leaving the diamond projecting about ⅛ in. out of the end of the shank. The front of the diamond is ground the same as the face and is relieved slightly toward the back. The sharp corner is slightly rounded so that it will not break off.

The method that should be followed in grinding or sharpening these tools is precisely the same as that employed in sharpening a steel single point boring bar tool except that care must be used, of course, to grind away as little of the stone as is possible. Care should be taken in setting the diamond tool in the bar to see that the cutting edge is parallel to the axis of the bar. To prevent injury to the diamond, the machine operator should be instructed to handle the tools with the same care he uses for any fine tool.

Factors of a Foreman's Success

BY ROBERT GRIMSHAW

The factors making up a foreman's success might be laid down as the possession of those qualities that make almost any leader successful: Knowledge of his own qualifications, of his defects, of the abilities and limitations of those with whom he comes in contact, of the activity in question, and of the ability to impart his knowledge and make himself obeyed.

But some things might be pointed out as the potent factors in a foreman's success. They may be worth cultivating if nature has not been generous in this connection at birth, and if opportunity and environment have failed to make amends for those qualities which nature has neglected.

Perhaps the first factor that might be particularly singled out as desirable, is openmindedness. This is the willingness to admit that others do, can, or have an inherent right to know something; or can even be on the right side of a disputed question.

On broad general principles, the foreman is assumed to know more, even in petty details, than those under him. But if he cannot show this to the satisfaction of others he will be set down as wrong. Once his fallibility and ignorance are shown to exist and to be backed by his tacit or other declaration of infallibility, his influence for good, his strenuous seeking for progress in the work, his most earnest efforts for the betterment of his operatives' condition, are weakened, if not entirely destroyed.

Six Ways of Securing Co-operation and Interest from Your Men—Discussion

BY EDWARD O. PERRY

The article by E. O. Kuendig under the title given above on page 680 of *American Machinist* corresponds with the views and practice of the writer during long experience in the management of help.

I know of no condition in life where the Golden Rule is more applicable than in the relations between the employer and employee. Never ask a man to do anything that you would not willingly do yourself if you were placed in his position. Give them the benefit of every doubt, but remember that under good management there should be few doubts. Hard work and good pay, honestly earned, give greater satisfaction than any other policy I know of.

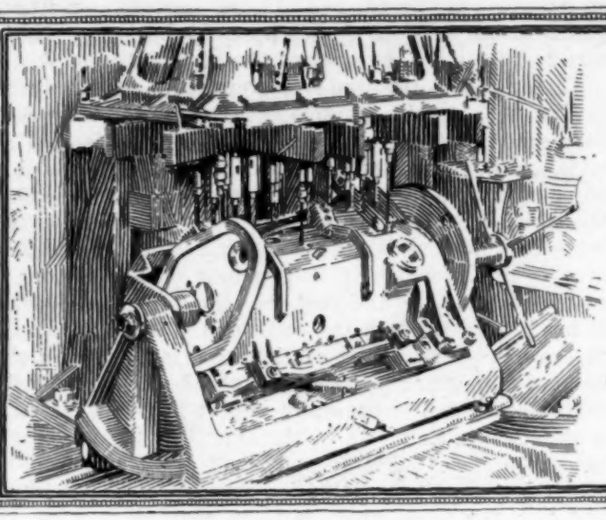
OPERATING ON STRAIGHT PIECE WORK WITH A HEART IN IT

I will cite one case among many that came under my supervision where the policies mentioned by Mr. Kuendig were carried out to the utmost. It was in a plant manufacturing heavy, portable railway equipment, and which in addition to office and engineering departments, consisted of machine, foundry, blacksmith, boiler, paint, pattern and minor departments. The greatest number of men employed at any one time during my administration was about 1,100. It was an old institution and had been in the hands of a receiver for several years, but through the generosity of some of the people of the city in which it was located, funds were furnished to place it in operation again.

After a preliminary investigation of the plant, I took a position with the company as general superintendent and proceeded to make radical changes.

Straight piece work, with a heart in it, was the first innovation. In its introduction I met with bitter opposition from the workmen, the cause of which I soon located in a radical group that had been driven out of a large plant then on strike in a neighboring city. With this knowledge, I soon got rid of the trouble through the elimination of that element. I made it my duty personally to urge the acceptance of piece work by every one opposed to it. In order to make a good start, I personally set the prices and hired the help, and in general remained in close touch with every one along the line. In less than three months we had the machine shop and foundry on piece work, and the well filled pay envelopes of the men in those two departments were sufficient influence to bring the remaining departments into line without further effort. Before that time I had selected from the shop a cleancut, bright looking machinist for the position of chief inspector and rate setter, and I never regretted the selection, as he proved one of the most loyal and honorable men that ever worked for me.

It would be encroaching too much on your valuable space to describe all that was done to insure harmonious relations between the workmen and the company. There were secured for the former higher wages than they had ever had, and for the latter more profit than they had expected. More than that, the employers had the right to complete control of their business in all its details, without question from anyone, either inside or outside of their plant. All this was accomplished in the most satisfactory manner and perfect confidence established between the workmen and the company.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Design of Piercing Dies Begun—Principles and Important Points of Piercing Dies—Plain and Button Dies—Punches, Dies and Strippers

PIERCING dies are often used for producing holes in work which has previously been blanked or formed, and also occasionally for making holes in flat stock from the strip. We have already discussed the use of piercing dies when the operation consists of blanking and piercing in progressive dies, and several points which have been mentioned in the preceding articles are also applicable in the design and construction of piercing dies.

Dies of this kind may be roughly divided into several types, although the dividing line is not sharply defined and the classification cannot be made very distinctly. Roughly speaking, however, the grouping is as follows:

Plain piercing dies, which are so designed that they handle plain blanks of various shapes or pierce the holes in sheet stock according to the requirements of the work.

Button dies, in which the dies are made in separate units and inserted in their proper locations in the die shoe. This form is economical, so that in manufacture and upkeep it is often used when the holes are a considerable distance apart. Button dies may be standardized to advantage when work is of such a nature as to require a number of them. Blanks of standard outside diameter can be made up according to the size of the holes required, after which it is only necessary to bore and lap the hole and fit the button to the die shoe.

Multiple piercing or gang dies are used when a number of holes are to be pierced close together in a given piece of work. Both dies and punches are of somewhat different construction than those previously described. The details of design and various points of importance will be mentioned specifically later in this article.

Perforating dies are often required in ornamental brass and silver work and for such parts as armature disks, slotted radial plates and both plain and cylindrical work requiring perforations of various shapes and sizes.

The construction of piercing dies is comparatively simple, yet when a number of holes are to be pierced in an irregular piece of work, the design must be carefully made and a construction used of the most approved form if best results are to be obtained. The designer who applies his knowledge of fundamental principles to the construction of dies and who studies not only the design but its application in actual practice, considering carefully at the same time the upkeep and preservation of accuracy, will discover new points of interest continually and find fresh food for thought in the solution of each problem presented. A number of important points regarding the design of piercing dies are given herewith; others will be mentioned in detail later.

(1) Laying out the work. The importance of this matter has been emphasized in previous articles several times and in the design of piercing dies also it requires fully as much consideration as those previously mentioned. A decision must be reached as to the best type of die for the work in hand and in what manner it can be handled most advantageously.

(2) Thickness of stock. It is essential that the thickness of the stock should be in correct proportion to the amount of material around the holes which are to be pierced. If the allowance is not sufficient the work cannot be pierced so as to obtain good results. Hence, this point should be considered at an early stage in the design. The diameter of the hole is also important, as it is not practical to punch a hole smaller in diameter than the thickness of the stock. When holes of smaller size than this are required, a drilling operation is usually necessary.

(3) Location of work. A great deal depends upon the shape of the work and whether the piercing die is to operate on strip stock or on separate blanks previously punched. The location depends to some extent on the relation which pierced holes must bear to other holes, slots or surfaces. Therefore the method of location must take these matters into consideration and must at the same time provide for the possibility of slight variations in the blanks. Obviously this matter depends very largely on the general shape of the work and its requirements. Particular attention must be paid to work requiring a high degree of accuracy.

(4) Guide for punches. Piercing punches are often small in size and therefore easily broken. Attention must be paid to proper support in order to avoid such a contingency. Usually the stripper plate acts as both

For the authors' forthcoming book. All rights reserved.

guide and support, having a function somewhat similar to that of a bushing in a drill jig. In point of fact, bushings are often used in the stripper plate to guide and support the piercing punches and prevent breakage. The stripper plate therefore must be located carefully and so arranged that it can be used as an accurate

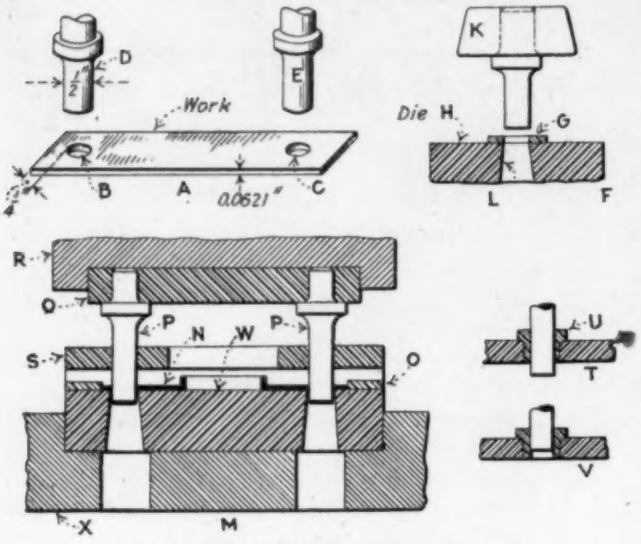


FIG. 482—PRINCIPLE OF PIERCING DIES

location and suport for the punches. Several examples illustrating this point are given in this article.

(5) General points in design. Consider carefully the operation to be performed as a whole. Look at it in a broad-minded way and with a large amount of common sense. Take up each point in design carefully and analyze the operation to make sure that suitable provision has been made for all contingencies. Consider the operator from the standpoints of both safety and convenience. Finally, design the dies so that they will produce the work in the shortest possible time, well within the required limits of accuracy and with suitable provision for upkeep when worn or broken through use, misuse or neglect.

Principles Involved in Piercing Dies

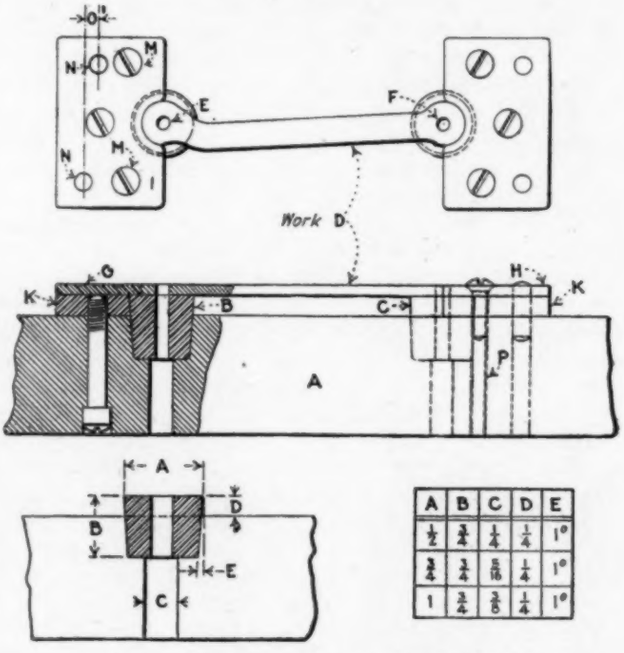
In piercing metal such as steel it is customary to allow an amount of stock around the hole to be pierced equal to or greater than ½ the diameter of the hole. It is possible to allow less stock than this in exceptional cases but it is not advisable, as there is always the possibility that the blank will be distorted when piercing so that the resulting product will be unsatisfactory. When a blank is to be produced having an amount of stock around the hole which is less than half the diameter of the hole, it is advisable to make a test by piercing a few pieces in a simple die rather than to design and construct one of more complicated form which may, under test, prove unsatisfactory. The experiment will demonstrate whether the stock will stand the strain of the piercing, and if found impractical to use a piercing die it may be better to produce the hole by means of a drilling operation.

Another important consideration in the design of piercing dies is to make sure that a hole of smaller diameter than the thickness of the stock is not required. In such cases the punch is subjected to an excessive strain due to the small diameter, so that it will not withstand the pressure and thus causes a great amount of trouble by breakage. Under certain conditions modifications may be found possible, but only after a series of tests has determined the advisability of it.

The principles involved in piercing dies are illustrated in Fig. 482. In the example shown at *A* the work is to be pierced at *B* and *C*. The blank is 6 in. long, 1 in. wide and 0.062 in. thick. The diameter of the holes to be punched is ½ in. and the distance between the end of the work and the holes is ¼ in. The punches for this piece are shown at *D* and *E*; and at *F* is shown a section of the die in which it is apparent that the work *G* rests on the die *H*, and that the punch *K* descends until it has passed through the work and entered the hole *L* in the die. When work of this kind is pierced, a slug is produced which passes through the die and bolster of the press and is generally caught in a box placed in a suitable position. As in blanking dies, the work must be carefully located when piercing is to be done, and the method of location selected is naturally governed by the shape of the piece which is to be pierced.

In the diagram at *M* a sectional view of a piercing die is shown which is used for piercing eight holes in the work *N*. This piece is round in shape, and it is located by "nesting" it in the locating ring *O*. The punches shown at *P* are fastened to the punch plate *Q* which is screwed to the punch holder *R*. Attention is called to the manner in which the punches are guided by the stripper *S*. In the diagram the punches are shown after they have passed through the work and are ready to be withdrawn.

In order to prevent the punches from binding or cramping in the work, it is necessary to use a stripper as indicated. It is apparent that when the punches are withdrawn the metal comes up with them until it strikes the stripper, which sheds the work so that it can be



A	B	C	D	E
½	¾	¼	¼	1°
¾	¾	5/16	¼	1°
1	¾	⅜	¼	1°

FIG. 483—APPLICATIONS OF BUTTON DIES

taken out of the die and replaced by a new piece. When the work which is to be punched is made of tough stock or when a hole of small diameter is being pierced, the stripper is of great assistance in stiffening the punch and guiding it to a correct location. In many instances it is found necessary to fit the stripper with bushings

in order to support it rigidly and at the same time provide accurate location. In the example *T* a stripper plate is shown having a bushing *U* mounted in it.

The diagram at *V* shows the punch in its furthest upward position, and the designer may note that the punch is not entirely withdrawn from the stripper or bushing when the punch-holder is raised. Referring to the section of the die shown at *W* to hold the work *N*,

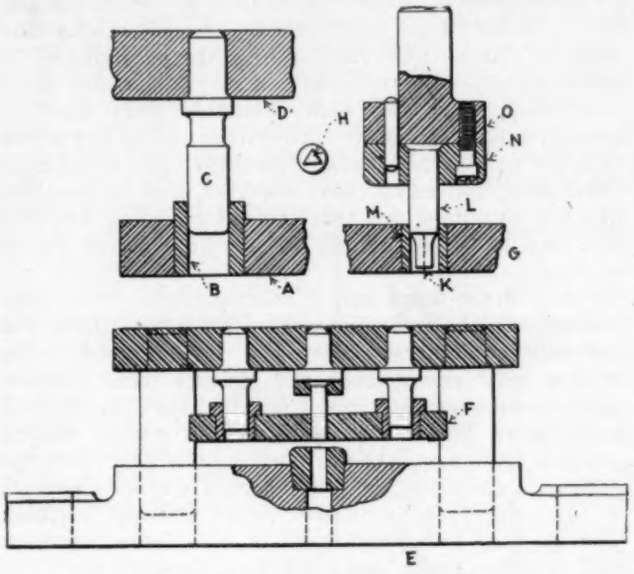


FIG. 484—STRIPPERS, STRIPPER GUIDE PINS AND PUNCH FOR HOLE NOT ROUND

it will be noted that the die is of solid construction mounted in a die shoe *X*. There is a considerable amount of steel used in this die which is unnecessary and the construction would be simplified considerably if button dies were used for this piece.

Button Dies

An application of button dies to a piece of work where the holes are a considerable distance apart is shown in Fig. 483. It also illustrates how dies of this sort may be standardized to some extent, thus simplifying and cheapening the manufacture. Primarily, a button die may be considered as one in which one or more cylindrical pieces of steel are substantially held and located in a die-shoe. Each button or disk has a hole through it for the punch to pass through after the work has been pierced.

At *A* the die shown is a cast-iron shoe having two button dies *B* and *C* mounted in it as indicated. The work *D* which is to be pierced at *E* and *F* is nested or located by means of the two plates *G* and *H*. The button dies project somewhat above the face of the die-shoe, and it is therefore necessary to make the locating plates of a corresponding height. The reason for setting the dies so that they project above the face of the die-shoe is to permit them to be ground a number of times when they become dull, thus giving long life to the dies. The locating plates, being built up to a height such that they conform to the height of the die, can be very easily adjusted after each grinding by taking off a corresponding amount from the filler plates. These latter plates are indicated at *K*, and both location plates and fillers are held by screws *M* and dowel pins *N*.

The dowel pins are staggered as shown at *O* in order that replacements of the parts may be made so that they will always come in the same position. By staggering the holes, errors in replacement of plates will be evident when reassembling after grinding, and as the plates can be put back in the original position only, incorrect assembling is avoided. When tapping the hole shown at *P*, care should be taken that it is tapped deep enough so that the screw will not bottom after the die has been replaced after grinding.

We have previously taken up the standardization of punch holders, punches and dies for blanking purposes. As button dies are used frequently, we have given in the lower part of the illustration just considered a table which shows the dimensions of button dies used for piercing various sizes of holes. In all cases the dies project ¼ in. above the face of the die-shoe and the angle on the sides is one degree. It is not necessary to fasten the dies into the shoe, because the slight angle of taper makes them fit so snugly that screws or dowels are unnecessary.

Strippers for Piercing Dies

Strippers for piercing dies are more important than those used for other purposes, as it is often necessary to support the punches by means of the strippers, particularly when punches are small and delicate. When button dies are used for piercing holes the stripper is often mounted on the punch holder. The method shown in Fig. 484 illustrates a construction somewhat different from that used in blanking dies. Here the stripper *A* is provided with a bushing *B* and a guide pin *C*, the latter being held in the punch holder *D* as shown. When the stripper is mounted in this way an accurate and

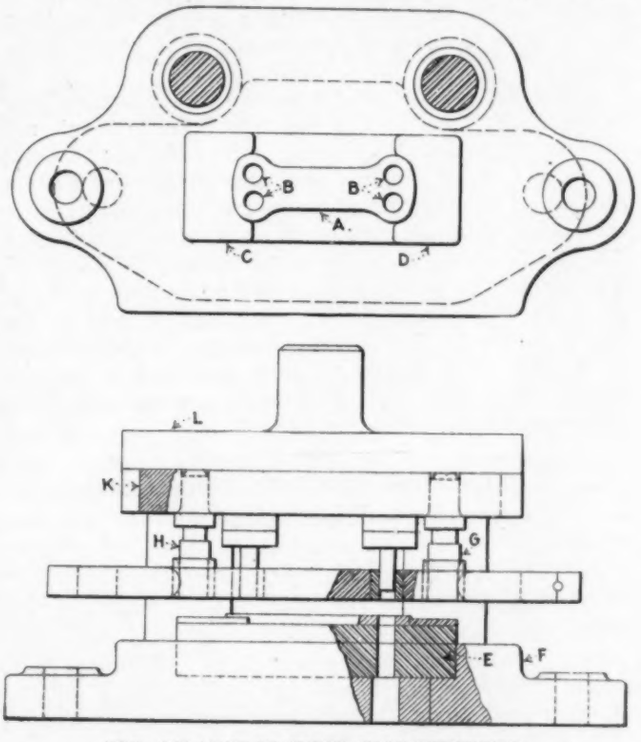


FIG. 485—DIE HAVING CAM STRIPPER

rigid support is obtained, which is essential for accurate piercing operations.

At *E* is shown the general arrangement when mounting a stripper of this sort. Stripper *F* contains two bushings and two guide pins which fit the bushings. The springs used in this stripper plate are not shown, as the diagram is only intended to illustrate the method in which the the guide pins are used. A button die is

shown in position, together with the punch which is used for the piercing operation.

It is frequently necessary to provide a bushing for the punch as previously mentioned, particularly when a small diameter or irregular shape is used. The punch in the example shown at *G* is of triangular shape, as indicated at *H*, and it has been shaped down as shown at *K* while the body *L* is round so that it fits the bushing *M*. The punch in this instance is of the wire type, and it is held in position by the cap end and the thrust is taken by the punch holder *O*. A construction of this kind is very frequently used in piercing dies, and it will be found satisfactory in many cases.

Cam Stripper

A cam stripper is often used in piercing operations, and its use is in connection with presses of special design. The operation is entirely automatic and is controlled by the ram of the press. This type of stripper comes down on the work and assists in holding it down and straightening it out if there should be a wrinkle in it, always assuming that the stock is not too thick. This stripper also keeps the work straight and in position so that it does not shift as the punches enter into it and pass through it. It remains in position holding the work until the punches have been withdrawn, after which it moves upward with the ram of the press. An arrangement of this kind has the advantage of preventing the blow against the lower side of the stripper plate, which with stationary strippers occurs on the return stroke of the slide, because the play necessary between the die and the face of the stripper permits the punched bar or sheet to draw up against the plate before stripping.

In Fig. 485 is illustrated a die in which a cam stripper is employed. The work *A* has four holes to be pierced in it in the positions indicated at *B*. The work locates in the set edges *C* and *D* and also on the die *E*. On account of the position of the holes, which are close to each other, a button type of die is not used in this case. The die is mounted in the usual manner in a shoe *F*. The stripper is provided with two guide pins at *G* and *H*, these being mounted in the punch *K* held in the punch holder *L*. The piercing punches in this case are of the wire type similar to those described in the preceding illustration and the general construction of the dies is of the sub-press or pillar type.

What About Machine Tool Prices?—Discussion

By F. P. Terry
Belfast, Ireland

The editorial under the above title on page 311, Vol. 57, of the *American Machinist* introduces a very interesting subject at the present time. Without doubt many intending purchasers are still "holding off" for further reductions, though there are many exceptions. The editorial mentions "That the machine tool builder has never charged enough for the product of his brain and skill," wich is undoubtedly true in substance and in fact. Why this is so it is not difficult to understand, but we cannot blame the builder, and, if the time has now arrived for a better state of affairs, he is fully entitled to the extra forthcoming. No doubt, in the past, machine tools have been the means of building up huge fortunes for the purchasers. They have been purchased on the basis of what they cost to build, after which they have been put to work producing articles that have been sold on the basis of what they will save, bringing profits to the manufacturer in many cases far beyond the wildest dreams of the machine tool builder.

If we look back a little into the history of machine tool building, we find that engineering firms began by building their own tools and in some cases supplying a few other firms with certain specialties at a good price on the take it or leave it principle, by which method they disposed of all their production, and it was this state of affairs that started firms to specializing in machine tools. The outlook was rosy and a few firms made money, but they soon found that they were up against a most unhealthy competition and unless prices were cut to the bone users of machine tools made them themselves, and many cases could be given where this was not only done but that the machine tool builder's own tool was used not only to provide a design but to produce its kind.

Some thirty years ago I was employed by a large firm engaged in producing several kinds of engines and hydraulic machinery. They had several good radial drilling machines without any maker's name thereon, and on enquiring into this, I was told that the old man some years before had purchased a radial drilling machine from a well-known machine tool firm and after getting a quotation for half a dozen was so staggered at the price that he decided to go into the business. The machine purchased was stripped down, drawings and patterns made, and from that time on they just made others as required. That he was stealing the machine tool builder's brain and skill he never gave a thought, although he was most particular about his own products.

A Well Known Occurrence

Hundreds of cases of this sort could, no doubt, be given by machine tool builders; many could be given by myself, but I never heard of a firm building its own supplies of other kinds, such as typewriters, time clocks, etc. Consequently it was this state of affairs that compelled the manufacturer of a turret lathe to make its cost as near as possible to the ordinary lathe, regardless of the saving it would effect, and so on throughout the line.

Only a short time ago I was in charge of a machine shop wherein to get machine tools always brought on a long debate on the enormous price, yet this same firm never hesitated a moment over foundry equipment, "owing to the labor saving effected," and a rough contraption of a few castings and bright drawn bars that would shake sand in or out of flasks would be ordered off hand regardless of what it cost to make. "It will soon save its cost" was the principle worked upon, and quite right too, but why it is not recognized more with machine tools is difficult to understand. Machine tools frequently save their cost many times over in what they produce, for which cash is drawn, and some manufacturers see and realize this, but it is regrettable more do not look closer into the matter. If they did, we would not see so many shops full of relics that have passed their day and generation, and the machine tool trade would be as busy as it deserves to be. In years gone by a few of these relics were very useful for starting the boys, but today, with lathes and tools simplified for this purpose, there is no excuse for their use, or the space they occupy, and to put a boy to work on relics only tends to injure his chance of success in life.

What's Wrong with the Railroad Shops?—IV

Suggestions Regarding Interchange of Information and Standardization of Parts and Methods—Remarkable Cost Keeping Systems

THOUGH A NUMBER of things were criticised in the previous articles, many more faulty conditions were observed and might have been mentioned, except for the fact that the world does not derive benefit from criticism unless it be constructive. On the other hand no improvement can be suggested unless it is first pointed out where improvement is needed.

This need for improvement may be evident to the outsider, but may not be appreciated by the man who has been working for many years under the criticised conditions. At the same time it must be remembered that the casual visitor may not have the proper perspective; that he sees details only and may condemn the whole because some of the operations are not so good as they might be. Straws will show in which direction the wind blows but, after all, a single straw does not tell us much; it may have dropped from the hay wagon and there may be no wind at all. However, when the place is full of straws and they all point in the same direction, we may safely assume that there is a wind and that its direction is the direction of the straws.

WHY HAS there been no successful attempt to standardize parts, equipment or methods in the railroad repair shops of the country? The element of competition is absent and the work in all the shops is much the same, yet hardly any two shops do the same job in the same way. The cost keeping systems are bad, but no worse than many that may be found in other shops. We are not concerned with the other shops, however, nor with excuses for existing faults. Neither are we trying to blame anyone for any particular thing nor for the whole situation. Our sole purpose is to point out the more obvious difficulties and to suggest, in so far as we are able, remedies that may be applied without adding appreciably to the expense of the railroads and without running afoul of the regulatory bodies that are undoubtedly with us to stay.

In the case of the railroad shops, there were so many straws that we were confronted with what the Frenchman calls "L' Embarras du choix." It was difficult to choose from the many things we saw those cases which could be handled in a few short articles in such a manner that both the trouble and remedy would be apparent to the reader.

Let us take the matter of the driving wheel lathe and see what improvements a few observations may lead to.

In one shop a hard tool was found in the machine and in another a soft one. These tools were not made of the same kind of steel, yet both had to do the same kind of work, and therefore, might have been identical. For aught we know there may be many different kinds of steel used for this purpose and they may be heat-treated in many different ways. It is almost certain that one or two of the different kinds stand out above the others, and as railroad shops are not competing, there is no reason why all the shops should not use the particular kinds of steel and the particular ways of heat-treating that have been found to give the best results. All that would be needed then is a system of intercourse between the shops, not only of one but of all railroads.

Just imagine a society of master mechanics and superintendents with a paid secretary. All improvements in methods and operations are reported to the central secretary, who, at fixed intervals, informs every shop of the latest developments. If, for instance, a new kind of steel is tried out in one shop and is found superior to what was formerly used, this experience would be circulated. It would not be long before a sufficient number of tests had been made by a number of the shops to show beyond a doubt whether this steel is really superior for the purpose or not. It would probably cause communication of a number of other experiences either with the same steel or with other kinds. Some shops might have used this steel but with different results and might want to know why one shop could use it to advantage when another shop had to abandon its use. In short it would be very probable that there would be an exchange of experiences and ideas which would bring out not only the qualities of the steel under discussion but many other desirable and undesirable features and conditions about shops, equipment and methods. The same would apply to the heat-treatment, the shape, the angles, the dimensions, the supports for tools and whatnot.

This sort of thing cannot be done in the manufacturing industries because there is but seldom a sufficient sameness of material or product, and, even if there were, competition would not permit a manufacturer to make his improvements public and of benefit to his rival. However, such conditions do not prevail in the railroad shops. Here the product is the same—let us say driving wheels—same general shape, same material, same nature of cut, same type of machine used. Furthermore railroad shops are not competing so that there would be no business reason why any one shop should hold its methods hidden from others. We have a set of conditions here which permits of thorough co-operation and which might lead to beautiful results. Maybe there is an organization such as was suggested, but if so it has failed to work for the results are certainly absent.

Such an organization would do what is regularly done by the engineering department of an industrial company having a number of plants. Any improvement in tools or methods in one plant is handed over to all of them and the plant manager who failed to adopt a tested-out improvement would have to put up a very strong argument indeed to escape severe criticism.

This exchange of ideas is merely a method of standardizing. It is the collecting of data and applying them, work which is constantly going on in any well regulated shop. It costs some money but it pays; and, mark, each shop has to do this work for itself while railroad shops

are in a position to do it co-operatively, getting the full benefit for a small fraction of the cost. Not only that, but they would get greater benefit than any single shop would obtain because there are more experimenters and more observers.

It has long been recognized that standardization is one of the most important methods of reducing costs and expediting work, not only standardization of methods but of equipment and product, of tools and operations. Always excepting the exceptions there is very little evidence of standarization in railroad shops. Holes are rebored to any size that will make a clean job and the shaft or axle is fitted to this hole. There is no good reason why there should not be a few standard sizes to which such holes must be rebored. If this were done the male pieces could be made while the other pieces are being bored and they could be made in less time and by less skillful men. Furthermore, they could be kept in stock, thus avoiding all delay. This lack of standardization is not confined to the boring of holes. It is found everywhere, in sizes, in parts, in methods and in equipment.

More and Better Gages Needed

Standardization of parts and dimensions cannot be carried out without proper measuring instruments and gages. These are almost completely wanting. A micrometer is as rare in the railroad shop as in the average foundry, and gages are so conspicuous by their absence that the sight of an occasional one comes as a shock. At that, these few gages are generally of the crudest kind. One may find a rod to gage the bore of a tire and then see the workman try to balance a 12-in. scale at the end of that rod to make up for shortage.

There are many parts which could be kept in stock; there are others which, when not kept in stock, could be made to standardized dimensions and one naturally asks why this is not done.

The answer can only be guessed at. Gages cost money and such expense cannot be charged directly to repairs or maintenance or even to equipment, as is generally understood. They must come as part of a plan of action which may originate with the shop management but cannot be decided upon by them. Parties higher up must give authority to carry such a general plan into effect and they, as a rule, are not sufficiently familiar with shop operations to understand the importance and the ultimate economy which is certain to result from the purchase of fine instruments and gages which are capable of measuring to a much higher degree of accuracy than the rough work of repairing locomotives seems to demand. *Seems* to demand, we say, because, as a matter of fact, just as close limits are required for the proper fitting of locomotive parts as for typewriters and guns. An extra thousandth of an inch in the diameter of a driving axle makes a great deal of difference in the amount of pressure required to force it into the wheel. A few thousandths short in the bore of a tire increases the initial stress greatly.

Another possible reason why so few gages are used may lie in the fact that the rules do not permit the shop to make parts except on definite repair orders. Here again exceptions can be found but it can be stated as a general truth that most railroad shops live from hand to mouth. This minimizes the good effects which standardization might have.

Then there is perhaps that little vicious cycle of reasoning one always finds where conditions are not as they should be. The cycle may be something like this: We do not make more than one piece at a time because we have to fit them anyhow; and we fit them because there are not standard dimensions. We cannot have standard dimensions because we have no gages and what would be the use of gages if we make only one thing at a time and must fit it? Of course, such a complete cycle never passed through anyone's head but all of the elements may have at one time or another.

The thing to do is to break away from all existing conditions, from all reasons, excuses and alibis and start a new deal. Study out what would be the proper method of handling the work and get the best, quickest and most economical result; scheming as if there never had been a railroad shop. See where this ideal method differs from the one now employed and get ready to switch onto the new track. Not suddenly, not by tearing things up by the roots, but gradually, starting in with those things which will give the greatest results in the shortest time and with the least amount of expense.

Standardization is one of the things which can be introduced without a revolution, bloody or otherwise. It can be introduced piece-meal and does not require much equipment. A few micrometers and a little instruction will go a long way.

It does require, however, that the powers at the top should have confidence in the scheme and in the men who are to handle it, and it may be necessary for them to get somebody who is familiar with modern shop methods to help the shop manager over some of the rough places and point the way to him; for rough places there always are when one climbs from a rut onto the broad highway.

It may be argued that standardization cannot be carried out in some cases and would be of no benefit in others and this is undoubtedly true; but one should not condemn a scheme just because it is not one hundred per cent applicable. Such one hundred per cent perfection does not exist and should not be expected, yet the fact that a new method is not applicable to everything in the shop has often been the cause of its rejection when 90 per cent of the work might have benefited by it.

The lack of contact between the average railroad shop and manufacturing plants is vividly exemplified by the case mentioned in the first article where a number of geared head engine lathes were the tools intended for the manufacture of brass parts. Whether the shop was ill advised or whether the purchasing department refused to follow the recommendation of the shop we do not know. It was probably the former because the department was pointed out with a certain amount of pride. That such equipment would be used in any manufacturing plant for that same purpose is almost unthinkable.

Evils of Lump Purchasing

We venture to make a guess which probably is not far from the truth. We know of many cases where a list of equipment was issued to machinery makers and dealers who were invited to bid. In many such cases the entire list was covered by a single dealer who, not being able to furnish the exact equipment asked for, substituted such machinery as he was able to furnish. In doing so it was possible for him to reduce the price on some of the substitutes below what would have been a reasonable price for the machinery originally asked for. As a result that dealer would get the entire order, not because what he offered was superior to what anyone else had to offer, but because the total purchase

price was lower than could be secured by buying some machines from one and some from another dealer or maker. It might very well be that something similar happened in the case mentioned here. Whatever may be the case we consider it a glaring example of inefficiency and perhaps better illustrative of the lack of proper system, proper control, engineering knowledge and knowledge of manufacturing methods than anything else we observed.

One of the points mentioned in the last article was that a skilled blacksmith was making cold chisels and had a set of dies to assist him. Was he making them because the peculiar system of cost keeping made it appear as if the article could be manufactured more cheaply than it could be bought outside? It is of course very unreasonable to suppose that such is actually the case. A manufacturing plant which has all the tools and facilities for making an article in large quantities is certainly able to manufacture it at a very much lower cost than it can be made by hand and in smaller quantities. We say that the cost keeping system may possibly make it appear as if the article were cheaper than it actually is, and we have reason to think so because we found in another shop a system of computing the cost of axles made out of scrap which made them appear to cost less than half of the actual cost.

The amount of scrap used for an axle was not weighed but the finished forging was and it was figured that the amount of scrap originally used was equal to the weight of the finished forging. In order to make some money on the transaction the axles were forged from 16 to 24 in. longer than was required for the finished piece and the stub ends were cut off, that is 8 to 12 in. at each end. These ends were thrown into the scrap and the shop got credit for these pieces at scrap prices. If this shop had been a little bit more daring it might have made the axle forging come twice as long as required in which case the material would not have cost anything at all.

Other Costs Ignored

We hardly want to mention the fact that no loss of freight income was figured in. As a matter of fact this should have been done because if the scrap had been sold it would have been carried over this particular railroad and there would have been an income from this source. Nor was freight charged on scrap brought in from other shops or roundhouses on this road. The ingenious way of figuring the cost of this axle made it appear a very much cheaper article than anything that could be bought. Such bookkeeping, in any other concern, would soon put the company on the rocks but as the shop is only one of the minor elements of a railroad, the glaring faults lose their importance, or at least seem to do so.

That the railroad shop is handicapped in its methods, in its cost keeping and in many other items by the Governmental regulations is well known. We wish to point out here that we are not criticising any particular person or even the entire company. We are criticising conditions as we saw them.

There are many machines in a railroad repair shop which are not used all the time and some which are used only occasionally, but the greater part of the equipment is used quite regularly just as in the average manufacturing machine shop. Even if all of the machines were idle part of the time it would be good policy to have them clean, well adjusted, in good repair and up to date.

The workman cannot take pride in an old relic, particularly when it looks twice as old as it is with its battered T-slots, bent spindles, bare paintless spots, broken handles and the accumulation of dirt of which the lower layer was started 40 or more years ago. If the man takes no pride in his machine the chances are that he takes no pride in his work and that he won't even produce up to the capacity of his machine, small as it may be. It is a well understood principle in the average manufacturing plant that clean and neat surroundings will produce more and better work and keep the man better satisfied. Recognizing the fact that it is more difficult to keep a railroad repair shop in prime condition than most other machine shops because the work done there is repair work and means the dismantling of dirty machinery, realizing all this, we can yet see no reason why some of the railroad shops should be in the extremely dirty condition in which they are. That there is really no fundamental reason is proved by the fact that there are other railroad shops which are kept as reasonably clean as one might expect under the circumstances. However, this much can be said of practically all of them that the equipment is more battered and less taken care of than one finds in the average shop.

Preparation and Properties of Pure Iron Alloys

To protect life and property it is necessary that the architect and engineer know the kind of steel which should be specified for each use. To know what composition a steel should have to stand a certain amount of strain or meet the necessary requirements, the effect on the steel of each of its constituents must be known. The general effects of each of these constituents have long been commonly known, but technical difficulties have hindered really thorough studies of the specific and exact effects of each of the elements. Very pure iron is difficult to prepare, and it is even more difficult to add a controlled amount of some one constituent of steel to pure iron without some contamination.

In the belief that an accurate knowledge on this matter is desired by the engineering profession, and that such knowledge would prove beneficial to industry in general, the Bureau of Standards of the Department of Commerce has just issued Scientific Paper No. 453 dealing with the fundamental principles involved in the manufacture of steel products. The paper is entitled "Preparation and Properties of Pure Iron Alloys," and contains the results of a very careful investigation.

In this investigation iron of practically 100 per cent purity was prepared by an electrical method similar to the method of silver plating in which the metal is deposited from a solution by the passage of an electric current. The iron is plated out, leaving the impurities behind. This iron was then melted in a vacuum to exclude the effects of gases which would be taken up from the air if melted in contact with it. The heating was done electrically and the containing crucibles were made of chemically pure magnesium oxide.

Extensive series of alloys were made by remelting this iron in the same manner and adding carbon and manganese. Compositions were varied by small amounts so as to include the entire range of compositions found in ordinary steels. Specimens from these ingots were tested and results compared so as to bring out the effects of each element.

TABLE XI

Switzerland—Exports of Machinery for Working Metal, Wood, Stone, etc.

"Werkzeugmaschinen zur Bearbeitung von Metallen, Holz, Stein, etc."

Country	1909		1910		1911		1912		1913		1914		1915	
	Quantity q.n.	Value Francs	Quantity q.n.	Value Francs	Quantity q.n.	Value Francs	Quantity q.n.	Value Francs	Quantity q.n.	Value Francs	Quantity q.n.	Value Francs	Quantity q.n.	Value Francs
Germany	1,498	339,931	1,517	517,422	2,736	818,576	3,814	1,141,730	3,754	831,193	3,091	711,532	13,841	2,840,614
Austria-Hungary	444	104,062	481	167,521	896	236,040	1,218	273,772	408	98,757	518	141,574	12,663	2,963,632
France	1,432	418,794	1,145	401,275	1,477	447,577	1,540	456,330	1,876	625,496	2,822	711,380	21,180	6,031,790
Italy	854	186,876	1,297	221,630	1,207	210,186	1,502	268,855	1,658	334,989	3,024	348,775	16,896	3,892,549
Belgium	233	37,934	421	66,525	243	63,835	90	25,651	234	80,009	321	37,270	2	445
Netherlands	55	16,118	132	27,974	100	22,478	185	57,872	288	53,428	223	26,139	59	11,825
Great Britain	184	55,082	153	58,289	204	84,939	191	80,050	209	72,993	104	55,799	533	292,838
Russia	194	33,310	191	38,442	321	59,125	357	83,369	328	89,987	419	91,720	148	86,202
Sweden	7	1,710	51	10,310	70	21,880	48	11,230	22	5,080	17	10,765	110	31,832
Norway	2	820	.....	.....	39	10,210	32	12,840	9	2,225	29	8,130	150	38,955
Denmark	116	20,580	2	400	.....	.....	13	3,342	.....	.....	1	230	5	1,840
Portugal	.....	.....	48	7,055	6	1,200	33	10,230	153	51,550	31	5,702	.....	.....
Spain	61	9,365	146	27,190	587	73,052	231	34,526	299	58,717	372	63,929	294	62,441
Greece	.....	.....	.....	.....	61	9,050	21	3,400	1	150	46	8,280	.....	.....
Bulgaria	26	4,000	.....	.....	21	3,188	19	3,224	30	4,400	.....	.....	.....	.....
Roumania	64	9,900	.....	.....	25	6,980	3	460	.....	.....	41	8,740	193	29,585
European Turkey	.....	.....	19	5,500	277	132,340	.....	.....	22	1,698	.....	.....	.....	.....
Serbia	.....	.....	12	13,000	.....	.....	1	460	.....	.....	30	4,920	.....	.....
Czecho-Slovakia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Yugo-Slavia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Egypt	18	1,800	1	460	3	2,150	.....	.....	30	7,180	101	26,080	.....	.....
Algeria and Tunis	.....	.....	7	1,525	1	284	18	1,700	50	7,985	69	14,000	33	5,400
South Africa	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	500
West Africa	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
East Africa	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other Africa	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	300	.....	.....
Asiatic Turkey	.....	.....	26	3,930	2	540	.....	.....	66	9,000	4	850	.....	.....
British East Indies	57	11,030	39	5,950	66	10,070	2	370	1	130	29	4,050	.....	.....
French Indo-China	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dutch E. Indies	1	200	4	780	3	591	.....	.....	.....	.....	.....	.....	23	3,405
China	1	1,900	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Japan	.....	.....	.....	.....	21	3,625	29	11,887	52	14,400	.....	.....	41	11,855
Australia and New Zealand	48	6,940	33	8,306	81	10,395	4	2,500	.....	.....	1	674	3	1,500
Philippine Islands	.....	.....	.....	.....	.....	.....	113	17,400	.....	.....	.....	.....	14	2,800
Canada	37	7,500	26	23,950	4	1,000	7	3,050	.....	.....	.....	.....	.....	.....
United States of America	44	18,245	42	21,514	46	24,104	118	54,515	113	55,559	39	23,113	205	46,170
Mexico	.....	.....	.....	.....	.....	.....	3	1,500	4	1,700	1	300	.....	.....
Central America	.....	.....	.....	.....	.....	.....	19	6,550	.....	.....	.....	.....	.....	.....
Brazil	1	170	12	2,490	11	1,585	76	11,603	97	20,211	4	500	237	37,640
Colombia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Argentina	15	3,500	72	7,400	12	4,075	245	42,375	64	9,486	.....	.....	.....	.....
Chile	.....	.....	53	7,625	32	5,500	1	332	17	2,340	42	7,220	.....	.....
Other Countries	.....	.....	26	3,880	15	2,850	17	4,117	.....	.....	35	8,290	.....	.....
Total	5,392	1,289,767	5,956	1,650,343	8,567	2,267,425	9,950	2,625,240	9,785	2,438,663	11,416	2,380,262	66,634	16,393,818

TABLE XI

Switzerland—Exports of Machinery for Working Metal, Wood, Stone, etc.—*Continued*

Country	1916 Quantity q.n.	1916 Value Francs	1917 Quantity q.n.	1917 Value Francs	1918 Quantity q.n.	1918 Value Francs	1919 Quantity q.n.	1919 Value Francs	1920 Quantity q.n.	1920 Value Francs	1921 Quantity q.n.	1921 Value Francs
Germany	9,762	3,669,446	51,444	20,847,428	3,303	1,680,747	1,429	1,254,226	830	751,685	572	406,000
Austria-Hungary	2,346	942,374	6,077	2,538,512	4,590	1,653,417	62	28,371	104	11,854	499	114,000
France	80,483	26,037,485	42,493	16,946,895	25,572	11,699,969	35,444	18,281,927	46,113	19,801,022	16,709	7,338,000
Italy	52,573	15,585,442	14,590	4,187,858	18,903	6,584,501	24,883	7,135,442	12,503	4,386,267	2,357	717,000
Belgium	.....	.....	3	2,243	.....	.....	2,699	1,096,476	7,402	2,408,493	1,704	620,000
Netherlands	126	24,358	289	62,285	2,613	988,136	3,145	1,198,810	1,765	931,871	563	401,000
Great Britain	2,763	1,013,415	433	342,878	937	679,906	1,422	1,289,317	2,740	2,953,296	1,338	902,000
Russia	1,006	502,399	52	38,963	.....	.....	19	8,456	.....	.....	.....	.....
Sweden	17	9,755	48	26,125	18	12,350	46	26,296	389	201,251	25	15,000
Norway	100	21,505	40	18,001	5	4,365	51	45,177	52	65,406	65	65,000
Denmark	5	4,100	2	853	3	2,200	7	6,950	39	49,608	.....	.....
Portugal	53	12,650	23	4,273	2	150	62	41,279	1,122	501,240	21	13,000
Spain	421	80,750	180	70,671	574	339,690	1,143	556,898	2,759	1,214,683	747	340,000
Greece	133	22,200	13	3,000	.....	.....	67	31,148	253	80,269	104	38,000
Bulgaria	10	7,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Roumania	1,885	599,458	805	225,947	.....	.....	139	38,262	5	5,086	.....	.....
European Turkey	.....	.....	.....	.....	.....	.....	.....	.....	55	23,770	.....	.....
Serbia	.....	.....	.....	.....	.....	.....	58	21,229	.....	.....	.....	.....
Czecho-Slovakia	.....	.....	.....	.....	.....	.....	.....	.....	53	38,305	633	583,000
Yugo-Slavia	.....	.....	.....	.....	.....	.....	.....	.....	2	2,100	.....	.....
Egypt	161	26,655	.....	.....	8	7,900	19	15,430	288	115,780	62	25,000
Algeria and Tunis	39	14,900	1	220	142	48,690	174	67,905	32	12,871	.....	.....
South Africa	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
West Africa	.....	.....	.....	.....	.....	.....	.....	.....	27	9,068	.....	.....
East Africa	.....	.....	.....	.....	.....	.....	.....	.....	11	2,310	169	51,000
Other Africa	.....	.....	.....	.....	.....	.....	9	8,990	.....	.....	.....	.....
Asiatic Turkey	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
British East Indies	29	3,600	.....	.....	29	6,620	36	11,543	234	164,684	44	24,000
French Indo-China	.....	.....	.....	.....	.....	.....	.....	.....	198	76,382	1	2,000
Dutch East Indies	87	21,781	264	54,896	133	33,260	305	143,200	486	196,678	209	112,000
China	46	7,061	.....	.....	50	9,600	.....	.....	.....	.....	.....	.....
Japan	35	19,853	1	2,960	8	8,062	1	2,288	127	118,085	423	367,000
Australia and New Zealand	28	3,900	.....	.....	.....	.....	127	83,800	93	52,209	39	44,000
Philippine Islands	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Canada	.....	.....	3	2,030	.....	.....	.....	.....	12	20,297	.....	.....
United States of America	89	28,266	108	48,526	20	10,891	646	667,309	2,608	1,510,927	205	281,000
Mexico	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Central America	.....	.....	1	1,006	.....	.....	1	1,200	.....	.....	.....	.....
Brazil	1	120	31	6,025	104	26,783	101	37,398	739	237,295	217	80,000
Colombia	.....	.....	12	4,444	.....	.....	.....	.....	.....	.....	.....	.....
Argentine	15	3,384	19	7,700	30	6,473	20	15,275	314	134,494	55	30,000
Chile	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other countries	.....	.....	.....	.....	.....	.....	.....	.....	5	3,948	195	95,000
Total	152,312	48,661,857	116,932	45,443,739	57,044	23,803,710	72,115	32,114,602	81,360	36,081,234	26,956	12,663,000

Value of Franc at parity is 19.30c

q. n. = net quintals or 100 kilograms = 220.46 lb.

The Disease Called Drafting—Discussion

By Elam Whitney

On page 643, vol. 57 of the *American Machinist*, Entropy refers to a comparatively new profession as a disease. The writer is of the opinion that this disease seldom becomes chronic as substantiated by the absence of old men engaged in the profession, as they either die before they get to be 45, get a transfer to some other department or enter into business for themselves. The writer could cite many cases of very capable draftsmen and designers who are saving every possible penny toward the purchase of a cigar store, gasoline filling station, etc. A friend who was considered a very good designer, formerly with two of the largest manufacturers of machine tools, resigned at the age of 35 years to engage in photography as a better business proposition. A designer of adding machines, about 37 years of age, has been working for over a year as a street car motorman. In the opinion of some, these men were "old" men, as witnessed by an advertisement in the help wanted columns of a St. Louis newspaper for a successful business man aged 25. At this rate the high school boy of the future will be playing the stock market.

Promotions Are Infrequent

The drafting room does not attract the ambitious, aggressive type and the writer's advice to the young graduate is to learn the profession if he wants something to fall back upon and then get into something else for, just as Entropy states, the promotions made from the drawing room are few and far between. Is drafting a profession or a trade? It is certainly considered a trade in some factories where the drawing room is located in one corner of the machine shop, the master mechanic acting as chief draftsman when he has time. The hours are the same as factory hours, 7 a.m. to 5 p.m. and sometimes until 5.30 or 6 p.m. The rate is an hourly one and the draftsman is "docked" for being late or sick.

Just as fair for the draftsman as the mechanic some reader will say, but either he is incorrect in judgment or unaware that many draftsmen have spent four years or more in an engineering school to acquire the knowledge which the average mechanic will not sacrifice his spare time to obtain. It looks easy to sit at a drawing board and push a pencil, but have you ever observed how few mechanics and tool makers stick to it after a trial? Good tool and diemakers are now averaging more pay than experienced and technically trained designers. The draftsman has one opportunity and that is to become the chief-draftsman but the latter seldom resigns. A good tool-maker may become an experimental engineer or foreman, tool room foreman, production foreman or chief inspector and any of these positions may prove to be stepping stones to general foreman or factory manager.

Twelve years ago a mechanical paper published a table which recorded two of the largest and oldest manufacturers of machine tools, located in different parts of the country, as working their draftsmen 10 hours daily and 9 hours on Saturday. The war changed this just as it caused a vast change in industry in general.

Drafting requires intense concentration and constant study and several years of the work will put a man into a groove which rapidly deepens into a rut, causing a loss of perspective. Then again the lack of contact with workmen throughout the factory makes the designer unfit for executive work.

The cure is to place the various designers at work in different parts of the factory for certain periods; not exactly an apprenticeship system but more of a post graduate course. This will result in better and more practical designs, better co-operation between drawing room and factory and a field from which may be selected better department heads and other executives.

The Law and Trade Associations

By J. Bainter

The status of trade associations in the eyes of the law has not received much attention during the past few months, but the question is still a very live one and deserves a little attention. Trade associations are regarded by most of the law-makers and executives at Washington as being necessary evils and they are conceded to have a place in the business and industrial world. The trouble is that this place is made a minor one, so that the usefulness of the associations is greatly impaired.

It is perfectly legal for representatives of industrial concerns to get together and talk over methods of production, markets and the many other phases that enter into the conduct of an industry. But when prices are spoken of, and should any reference be made to future prices, then these business men become law-breakers. This hampering of price discussions is what makes the trade associations less useful than they should be, and prevents them from exercising the greatest influence for good that could be given a business or an industry.

The most necessary and the most vital discussion to all business is that on the subject of prices and their control. There is a great deal that can be spoken of on this subject without entering into that field which is morally wrong—the monopoly control of prices for gouging the public.

Although this argument may sound a little unreasonable to Americans in general, it is strictly in accord with the legislation of other countries. Our laws with reference to trade associations make illegal here those things that are approved of abroad. Just viewed from that angle, it seems unfair to American business men to prevent them from co-operating on a subject of such vital importance, particularly when they enter into competition with these foreign manufacturers in export trade.

The chief and best remedy for the situation lies in relieving business of some of the legislation that now encumbers it. Although it may be possible to add some legislation that would be beneficial, the best step would be toward lightening the burden of legislation rather than adding to it. The Edge Law is a step in the right direction, but something more is needed.

What is needed is an amendment of the Sherman Anti-Trust Law, so that it will still prevent the monopolies, for which function it was created, but will not interfere with the ordinary conduct of private business. There is really nothing to be afraid of in this step, as the spirit of the original law can still be maintained. Such a step, allowing trade associations to discuss prices, would be a boon to the associations. It would give to them and to their members the stability that comes from a knowledge of existing business conditions and a reasonable insight into the future.

Testing Abrasive Wheels

Characteristics of Wheels Used for Different Purposes—Machines for Testing Hardness of Bond and Abrasive Qualities of Wheels

By H. H. LaVERCOMBE

THE MANUFACTURER of abrasive wheels is many times unjustly condemned when the proper results are not obtained by the user, owing to the fact that the information given by the user as to what is required is inaccurate. The producers of practically every article requiring to be ground are spending fabulous sums each year for unnecessary labor, power and wheels, through the use of wheels that are not properly adapted to the work in hand. I know of no other line of manufacture or industry where so much personal service is required as in the manufacture of abrasive wheels, and the fact that so much personal service and instruction are given, indicates an earnest desire on the manufacturer's part to give the best there is in him.

Now the fact that almost any abrasive wheel will grind (and it is difficult to tell when the maximum amount of grinding is being done) makes this problem more complex, for an operator will often consider that a wheel is giving satisfactory results when the surface produced is pleasing to him, regardless of the fact that the amount of work done in a given time is ridiculously small. Into this error he is often led by an unscrupulous but persuasive salesman.

Bond of Snagging Wheels

In a wheel, intended for snagging or rapidly removing metal, it is necessary that the bond be of the proper hardness or density, so that it will hold the grains of abrasive material in place until each one has performed its maximum amount of work, and the sharp points have been worn off leaving round or dull surfaces. The worn grains should then be released, allowing new and sharp ones to appear upon the surface. On the other hand, if a wheel is intended to be used for producing a polished surface, it is necessary that the bond be hard or dense enough to hold the abrasive grains until they have performed the maximum amount of work, and yet not long enough to cause the wheel to become clogged with particles of the material being ground and thus produce a glazed surface.

There is a vast difference in the amount of work which may be done, without sacrificing the "satisfactory finish," with wheels of the same grade and grain made by the different manufacturers. This difference may be due to any of the following causes: Accurate or inaccurate grading, careful or careless supervision in the manufacturing departments where the wheels are made, good or bad abrasive material, good or bad bond, proper or improper baking, etc. The writer has in front of him at the present time the analysis of some recent tests with four different makes of wheels showing that the cost of removing one pound of steel with one pound of wheel, ranges from $2.05 to $4.58, despite the following facts, i.e.: each wheel was made by a manufacturer having a national reputation; each wheel was supposed to be of the same degree of hardness or density of bond and to contain the same size of abrasive. Each wheel was expressly recommended by its respective maker's representative for the particular work on which the tests were made.

Effects of this nature in our manufacturing department compelled us to look for the cause, and in doing so we were so impressed that we commenced experiments which finally led to the development of abrasive wheel testing machines. These machines enable us to properly inspect all wheels upon their arrival in our receiving room, in the following manner:

To determine the hardness or density of bond, the wheel is laid on the table of the machine shown in

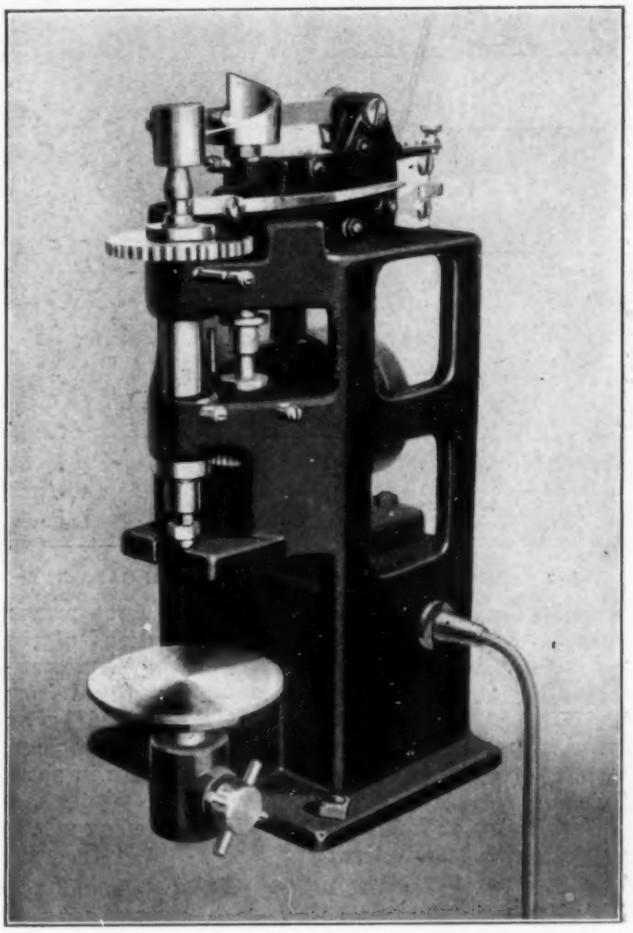


FIG. 1—MACHINE FOR TESTING CHARACTER OF BOND

Fig. 1. When the machine is set in motion, it raises at each revolution, a hammer of the correct weight to a certain height and then permits it to fall on the top of a spindle carrying a flat drill held in contact with the side of the wheel being tested. After each blow of the hammer the drill is turned a fraction of a revolution. When a pre-determined number of blows have been delivered the machine automatically stops and the depth of the penetration may then be readily determined by an indicator which is an integral part of the machine. As the hammer is impelled by gravity the same

number of blows struck in all cases and the area of the face of the drill always being uniform, the record of the resistance offered by the bond is very accurate.

The abrasive capacity is determined as follows:

The wheel to be tested is laid on the table of the machine shown in Fig. 2. A disk of the material to be ground is revolved at the proper speed, being held

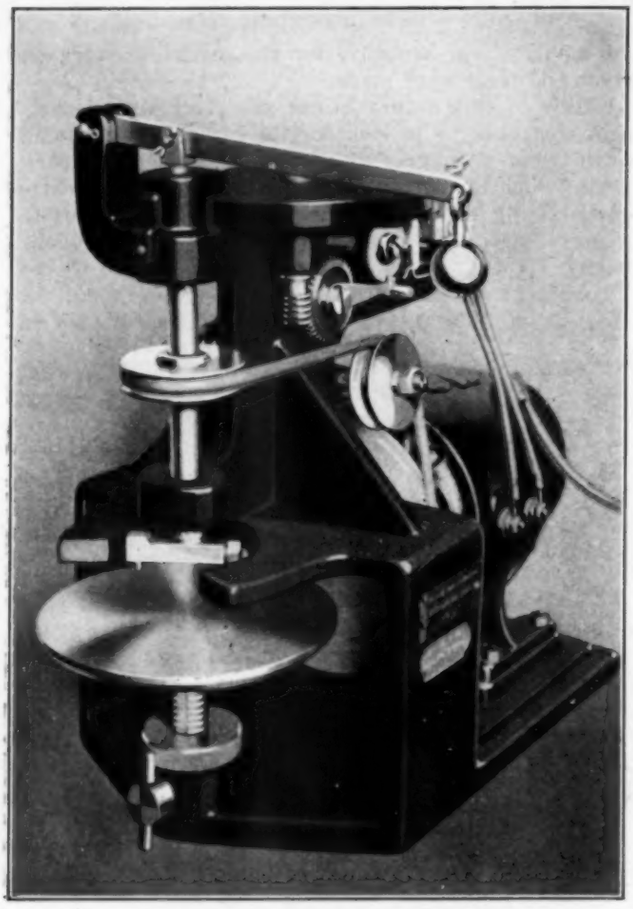


FIG. 2—MACHINE FOR TESTING ABRASIVE CAPACITY

in contact with the abrasive wheel under the proper weight. After certain number of revolutions of the test disk made in this manner, the machine automatically stops and the amount of material removed from the test disk may then be readily determined by an indicator which is an integral part of the machine. Complete tests may be made on both machines in about four minutes.

In the work of tool salvaging, we use grinding wheels exclusively to remove the metal necessary to reform the tools. Hence the value of these two machines to us has been inestimable.

Who Has This Information?

Daniel Adamson, of Joseph Adamson & Co., Hyde, Cheshire, England, is looking for a reference to "interchangeability" that he believes was made in a discussion before one of our national societies about 20 years ago. Three degrees of interchangeability were referred to: first, when the spare part could be adapted by slight alteration; second, where the spare part required radical alteration in the workshop before it would fit its intended place, and, third, when the spare part was of such a different pattern as to be useless.

The Foreman as an Element in Management

BY ENTROPY

The point of view in the discussion of this subject seems to depend very largely on the size and kind of shop under discussion. About all that is admitted by all hands is that their problems are "different," which makes the problem very much like all the other problems of management. Take, for example, a shop of my acquaintance, which began some years ago with six or eight workmen, one of whom was called foreman, mainly because he kept time on the other men for the owner who had other things which kept him away for the better part of the day. He was really superintendent, works manager, and about everything except treasurer and sales manager in terms of a large shop.

Then there is another shop, having some hundred or more foremen and two or three hundred straw bosses, in which no foreman performs any functions above those of his title. That is, none of them buy any materials, they requisition it from the stores: they do not decide the wages of their men, except on approval of several other men higher up in the organization. In general, they accept orders as to what to do, accept the men sent them from the employment office and the materials from the stores, which is largely sent them automatically as the work is shunted around the shop on a schedule. They are foremen stripped of most of the things that make a foreman's job interesting.

Looking back over the jobs I have had, and comparing those that I have enjoyed holding with those I enjoyed leaving, I am struck with the fact that those I liked to stay on have been those in which I knew what was going on. When I have been where doors were shut in my face and I was not in "the know" regarding things which vitally affected my work, I was only too glad of a chance to get out. It is very much like a man working in a shop alongside a railroad. If the windows are glazed with opaque glass, "To better distribute the light" he is always wondering just what minute a locomotive may get off the rails and tear into the shop.

Importance of Alloy Steels

An illustration of the importance of alloy steels is given in production statistics recently issued by the American Iron and Steel Institute. Despite an extremely low tonnage for the whole industry in 1921, the relative amount of alloy steel remained very close to its record 1919 figure.

TABLE OF PRODUCTION OF STEEL INGOTS AND CASTINGS AND OF ALLOY STEEL INGOTS AND CASTINGS IN THE UNITED STATES

[000 omitted]

	Total Steel, Gross Tons	Alloy Steel, Gross Tons	Alloy Steel of the Total, Per Cent
1909	23,955	181	0.75
1910	26,094	567	2.17
1911	23,676	481	2.03
1912	31,251	792	2.53
1913	31,300	714	2.28
1914	23,513	646	2.75
1915	32,151	1,021	3.17
1916	42,773	1,362	3.18
1917	45,060	1,644	3.65
1918	44,462	1,787	4.02
1919	34,671	1,481	4.27
1920	42,132	1,660	3.94
1921	19,743	809	4.10

Methods of Machine Tool Design

Principal Uses of Cams in Machine Tools—Cams for Holding and Clamping Devices —Cams as Feed Rate Variators—Contour Milling

By A. L. De LEEUW
Consulting Editor, *American Machinist*

CAMS are used for so many different functions that it is almost impossible to make a complete list of them. However, we are concerned only with their use in machine tools, and it may be said that in this class of machinery they are used mainly: for drives, for feed, for operating trips, for opening and closing holding devices, for operating magazines, for clamping, for belt and gear shifting devices, for indexing, for timing of movements, for stop motions, for regulating rate of feed, for generating irregular shapes.

Cams are not essential, or even very useful, for drives; cranks or eccentrics can almost always do all a cam can accomplish. They may be useful to a small extent for filing machines or for machines where two or more tools must work on one piece and where they would interfere with each other unless they were timed properly. Cams are the logical means to effect such timing.

We have already seen how cams can be used for feed. Their usefulness for this purpose is due to the fact that they produce a definite length and location of the feed stroke with any desired rate of feed and provide for a rapid advance and return, all without complication of mechanism and without reversing or fast running parts. Where intermittent feed is required they determine the exact time of the feed. One finds cams employed in this manner in slotters. The other uses of cams have been merely touched upon and we will now go a little further into some of them.

The actuating element used for tripping machine parts, such as clutches, etc., is the dog. A dog is a cam of very simple shape; it may be merely a pin or a triangular piece of metal fastened to a moving part and acting on some lever or slide so as to produce the required movement of a clutch, drop worm or other machine element. Sometimes a more complicated construction is used for dogs. When a dog is fastened to a reciprocating part it may be required to be active going in one direction and inactive in the other. In such cases the dog may be hung from a pin and be prevented from movement in one direction by an abutment while movement in the other direction is permitted. The weight of the dog, or a spring, may bring it back to normal when it has been lifted up on its backward course. See Fig. 193.

Similar devices may be used when it is desirable that one should be able to start a feed or drive immediately after it has been stopped and when it is not desirable that the operator should be compelled to hold his hand on the starting lever until the entire dog has passed the tripping point. Cams may also be used for placing certain machine parts in the position where they can be tripped by some other element. Still another function of a cam for the purpose of tripping is preventing a trip from being carried out completely.

We may imagine a clutch somewhere in the mechanism which can be tripped from right to left and vice versa. Let us say such a clutch is used in a tapping mechanism. In such a mechanism the tap should go forward up to a predetermined point, then the clutch should be reversed so as to bring the tap back by revolving it in the opposite direction, after which the same clutch should be tripped again. This time, however, it should be prevented from engaging the mating part on the other side. In short, after starting, the clutch should be automatically tripped from right to left and then from left to right, but should be prevented from completing this latter motion. It should stop in the center where it is out of engagement. This is ordinarily done by interposing an obstruction and doing this by means of a cam.

Cams for opening and closing holding devices are well known. They are used in automatic screw machines and in various other automatic machines where the work can be gripped automatically. Instances of cams for the opening and closing of holding devices for machines outside of the class of screw machines are not generally well known. They are used to a large extent for this purpose in special machinery and particularly for the purpose of gripping a piece and carrying it from one operation to the other. Pieces may be located in a magazine or hopper and a set of fingers, operated by a cam may pick up one piece and insert it in the spindle of the machine.

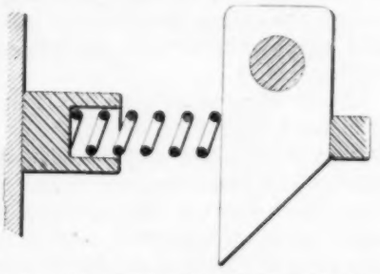


FIG. 193—DOG FOR RECIPROCATING MACHINE PART

After the required operation is completed, another set of fingers may pick up the piece before it is released by the spindle, turn it around, and insert it in another spindle for an operation at the other end. In the case illustrated here, cams are used four times for operating holding devices, twice for the chucks and twice for the gripping fingers. A well-known illustration of this kind is the slotting attachment used with some screw machines. Another illustration is the magazine feed for certain kinds of screw machines. Nothing need be said about these cams, except that they should be quick-acting and, as a rule, *can* be made very quick-acting because the parts to be moved are light and the only work to be done is the work of transferring. Some caution is required in the proportioning of the transfer fingers because too rapid a movement of the piece might make its location uncertain. Another point to be cautioned about is that as a rule the holding device picks a part out of the spindle and must grip it before the piece is released.

For this reason, the gripping must be of a gentle nature so as not to spoil the work or cause too much wear of the fingers by the gripping pressure. As the piece is held gently, it should not be swung around at too great a speed for fear that it may escape from the fingers. There are many kinds of magazine feeds in

existence, some of which do and others do not require cams. The action of such cams is in no way different from cams heretofore discussed. They are, as a rule, slow-acting and do not present any special difficulty.

On the other hand, cams used for clamping devices should be carefully thought out. Where clamping can be done by means of a toggle joint or some other device which can be brought over the center, nothing need be specially considered except the amount of pressure required. Cam and roller should be proportioned accordingly. The toggle joint in itself has provided means for exerting great pressure at the clamp without much pressure at the roller, but in cases where no such device can be employed, great pressure on the roller may be required.

In such cases it is essential that the cam become more and more gentle acting as the clamping point is reached, so as to be able to exert a great pressure without much effort at the circumference of the cam. In such cases there is always the possibility that there will be a certain amount of variation in the piece to be clamped and this may cause insufficient clamping at one time or an extraordinary amount of pressure at another. It is well, therefore, between the cam roller and the point where the clamp is applied to have some element which has enough elasticity to permit of a certain amount of spring.

As a rule, cams used for belt shifting devices are assisted by a spring or weight or some other means by which the shifting of the belt may continue for a short time after the cam has ceased to act. This is often necessary because the amount of time required for shifting is an uncertain element. It may well be that the part of the cam which is used for the shifting is past before the belt has completely changed over from one pulley to another. Making the cam act on a device provided with spring or weight which will complete the belt shifting makes the operation more certain. On the other hand, the uncertainty of timing remains and cannot very well be overcome. It can be held to a minimum, however, by making the belts to be shifted narrow and running them at high speed.

Cams for Shifting Gears

It is not advisable to use cams for automatic gear shifting on account of the uncertainty as to whether the gears will mesh or clash, but for hand shifting devices cams can sometimes be used to advantage. For instance, where there are several sets of sliding gears a cam may be arranged so as to pick up one pair of sliding gears, shift it to left, then to right, then to center, then pick up a second set, shift it to left, then to right, etc., so that the mere rotation of a crank will bring successive feeds or speeds into action without any attention on the part of the operator.

In many cases the indexing is performed by some special device and without the aid of cams. Such a device, however, must be kept in time with the cam and may be started by a cam. In other indexing devices the cam itself may perform this function by moving a lever or segment which performs the operations of withdrawing the locking pin, moving the index wheel, and releasing the locking pin so that it will drop in at the proper spot. The amount of motion which the cam would give to this lever or segment would be more or less uncertain, and if no special provision were made it might well be that the lever would still be attempting to move the index wheel after the bolt had shot in place. To avoid such interference, the lever or other device is often provided with a pawl which is lifted out of action by a pin placed at the proper point. An essential feature of such a device is that the index must be started and stopped at practically zero speed. The stopping especially should be very gradual, so that the momentum of the wheel shall not carry it too far. Not only the momentum of the wheel but that of the turret or other part which is indexed might cause an error in positioning. For that reason the cam must be laid out in such a way that the end of each operation takes place at a vanishing speed.

Timing Cams

One might say that all cams are used for the timing of movements, because they give a closed cycle of operations of which the sequence as well as the nature itself is determined by the cam. However, there are certain cams in use of which the most important purpose is the timing of operations. As a rule such cams take the form of a disk to which dogs can be attached. A clean-cut instance of this kind is furnished by the Brown and Sharpe screw machine in which disks are employed to which dogs can be attached. These dogs operate various levers which start single-revolution clutches. The position of the dogs on the disk determines at what particular point of the complete cycle each one of these clutches shall make its turn and perform its work.

The term "stop motion" is not commonly used in machine tool practice, but is used in the design of other kinds of machines, particularly automatic machines. It indicates a mechanism by which the movement of the entire machine or part thereof is stopped at a predetermined moment. A drop worm or a clutch which can be disengaged by the action of a dog are instances of stop motions. An illustration of a stop motion operated by a cam is the single-revolution clutch which was described before. This clutch is normally out of action because an obstruction, resting against a projection of the clutch, keeps it away from its mating part. When this obstruction is removed, a spring behind the clutch throws it into action. Before the clutch has made the desired number of revolutions the obstruction is once more placed in position and toward the end of the last revolution a cam-shaped projection built onto the clutch rides along this obstruction and causes the clutch to be withdrawn.

Cams are also used for the regulation of the rate of feed. We have no reference here to the fact that the slope of a cam strap or cam groove itself determines the rate of feed but rather that a cam may be used in such a way as to affect the rate of feed produced by some other mechanism. As an illustration of this kind we mention the Cleveland automatic screw machine. In this machine there is one cam for the turret tools which causes the turret to move forward and backward the same amount for each of the different turret positions. There is a fast and slow motion provided, but there cannot be any variation in the slope of the cam. The slow motion, which, of course, is used for the feed, would always have to proceed at the same rate unless some other means were provided to change it. Such means are present in the Cleveland machine in the form of cams.

The cams are of the very simplest nature, being merely strips of metal fastened to the circumference of a wheel of large diameter in such a way that they can project more or less beyond the edge of the rim. As each of the strips is fastened by two screws going through slotted holes, it is possible to set the strip of

metal either parallel with the rim or at a slight angle. The strips operate on a lever which moves the friction disk of the feeding device. Lowering or elevating the friction disk causes the feed to run at a higher or a lower speed. If the strips are set parallel with the rim of the wheel the feed will remain constant so long as one particular strip passes the roller, but the next strip, set further forward or backward, may move the friction disk one way or the other and thus cause a different feed rate. The feed rate, then, remains the same during the passage of one strip past the roller, provided the strip is set parallel with the rim of the wheel. When it is set at an angle, however, it will cause the friction roller to move during the passage of that strip and may cause an accelerating or retarding rate of feed. If desired, strips can be made with a contour which will give any kind of variation to the feed rate during the passage of the strip.

Such a device meets almost all conditions met in practice. The use of a friction device for feed makes the feed rate itself somewhat uncertain, not only because there is necessarily some slip which may vary, in amount according to the condition of feed disks and roller, but also because the rate of speed changes so rapidly for a small amount of adjustment of the roll that it is not practical to depend on this device if a certain predetermined amount of feed must be obtained. In such cases a positive drive for the feed must be employed and the variation in rate must be obtained in some other manner. Figure 194 shows such a device in elementary form.

To make the action of this device somewhat clearer we will take a concrete example. *A* is a piece of work of which the edge must be milled by cutter *B*. The piece is mounted on a turn table which is rotated by means of worm wheel *C* and worm *D*. The piece is supposed to be located centrally on the turn table. It will be seen that when the cutter is at the point *P* the rate of feed is in proportion to the line *OP*, whereas when the point *Q* is opposite the cutter the rate of feed will be proportionate to the line *OQ*. If the same rate of rotation of the worm wheel were maintained, we would have

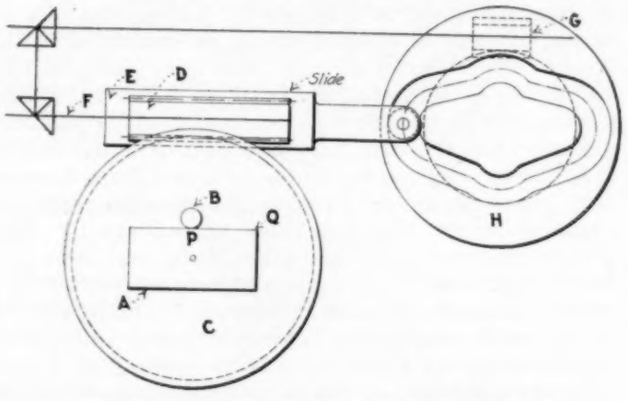


FIG. 194—POSITIVE VARIABLE FEED DEVICE

a much slower feed at *P* than at *Q*, and this would mean that either we will get an undesirable finish at the point *Q*, if the rate of feed is correct for *P*, or else that we will lose considerable time if the rate of feed is correct at *Q*.

The worm *D* with its thrust bearings is mounted on a slide *E*, and is driven by the spline shaft *F*. This shaft also drives a worm *G* through bevel gears, as indicated in the sketch, or by some other means, causing the worm wheel *H* to turn in unison with *C*. Mounted on the worm wheel *H* is a cam which causes the slide *E* to move backward and forward. This movement of the worm *D* will accelerate or retard the movement of the worm wheel *C*, and by giving the cam the proper shape we can give this worm wheel *C* such a variable motion that the rate of feed remains constant at any point of the work. In the sketch the cutter *B* is shown at a certain distance from the center *O*, and it is very obvious that this distance should be variable.

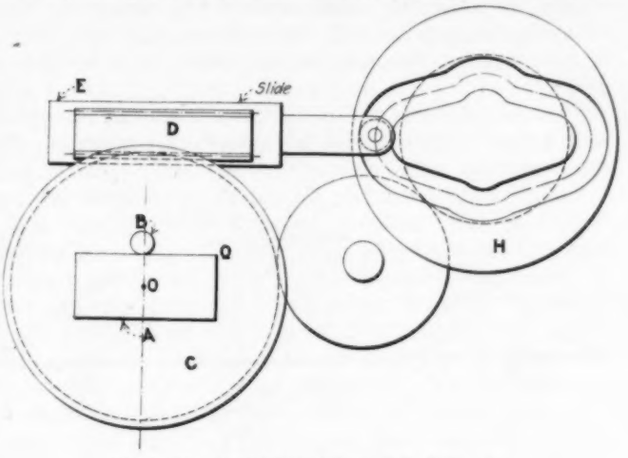


FIG. 195—MODIFICATION OF FIG. 194

This is easily obtained by mounting the cutter head on a slide which is moved backward and forward by means of a templet mounted on or under the worm wheel *C*. By giving the templet the proper shape the cutter can be made to take the proper position in relation to the work while *C* rotates.

With this construction it is rather difficult to lay out the correct shape of the cam on *H*, and for that reason it may be better to modify the arrangement as shown in Fig. 195. In this arrangement the cam is mounted on a spur gear, driven in unison with worm wheel *C* by means of another spur gear mounted on this latter worm wheel and by some idlers. Doing this simplifies the laying out of the cam materially. If the normal movement of worm wheel *C*, that is, when the worm *B* does not have any lengthwise motion, is such that the feed is correct for the point *P*, then we can easily find how rapid the movement of worm wheel *C* should be for a point P_1, located, let us say, 10 deg. to the right of point *P*. We can also figure out how much one inch movement of the worm *D* causes the feed to be retarded or accelerated, so that it is easy to figure at what rate the worm must be moving and in what direction when the cutter is opposite the point P_1.

As the cam rotates in unison with worm wheel *C*, we have found the rate of change in the cam shape at a point 10 deg. removed from the starting point. Working in this manner we can lay out the direction of the tangent of the cam every 10 or 5 or any other number of degrees. It should be noted that the cam in this case necessarily has a reversing action, that is, it sometimes pushes and sometimes pulls the worm slide. At the moment when the action changes from a push to a pull, there will be a certain amount of lost motion between the cam and the roller and this might have its effect on the finish of the work. Though the lost motion may be very small, its effect will be very great for the following reason:

Suppose the cutter to be opposite the point *Q*. The

action of the cam between P and Q has been to retard the movement of C. At Q this movement must suddenly change to an acceleration. If there is lost motion, then there will be neither acceleration nor retardation. In other words, there will be a moment at the point Q when the machine acts as if this device were not in existence, so that the feed will be the same as it was at the point P, which is entirely too fast. To overcome this difficulty, one should make a cam in the form of a face cam and depend on a spring, or preferably a heavy weight, to keep the roller against the cam edge, thus avoiding all lost motion. The cutter slide also should be held against the templet by means of a weight or spring.

The use of cams for generating irregular shapes is well known. Cams used in commercial machines are

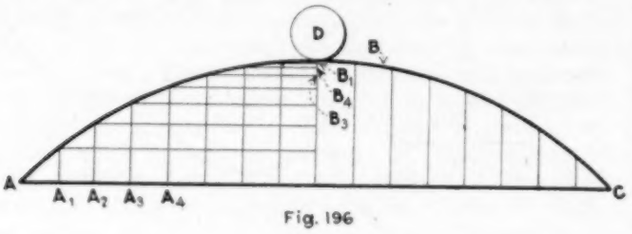


Fig. 196

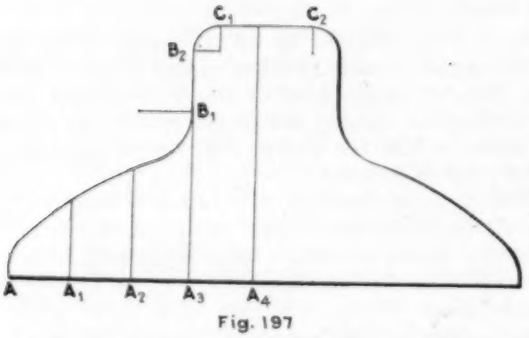


Fig. 197

FIGS. 196 AND 197—OUTLINES MADE BY TOOL GOVERNED BY CO-ORDINATE SLIDES

themselves the product of other cams. There are two distinct ways in which cams can be used for generating various contours. In the first place, a cam may be used as a templet, producing a copy of itself. Cams are used in this manner in cam cutting machines and attachments. In the second place, they may be used for the purpose of modifying the movements of some machine element so as to produce an outline depending on the shape of the cam but not a copy thereof.

If we should mount a cam on a shaft, hold this shaft in bearings mounted on a slide and then mount another casting of similar dimensions to the cam on this shaft, we have the elements of a cam cutting machine, or rather of a cam reproducing machine. If a stationary roller is held in contact with the first cam and a cutter of the same size and shape as the roller is made to act on the second drum, then all we need to do to reproduce the first cam is to give it a rotary motion. This principle of making cams is carried out in many modified forms. Cam cutting machines, automatic profiling machines and many special machines depend on this principle.

An entirely different method of making irregular contours is by means of two cams which act on two slides, moving at right angles to each other. This method corresponds with the construction of a curved line by means of its co-ordinates. The abscissas are laid out by one slide and the ordinates by another. In Fig. 196 the curved line ABC is supposed to be made in this manner. D is the cutter. The cams must be so constructed that the distances AA_1, A_1A_2, A_2A_3, etc., are traveled in equal times; and the other cam must be so constructed that the distances BB_1, B_1B_2, B_2B_3, etc., are traveled in equal increments of time.

It is always possible, of course, to make the distances AA_1, A_1A_2 equal, which means that we can give one of the slides a uniform motion by means of a screw or rack or similar device, in which case only one cam would be required to produce the contour; and such a method would probably be followed if a piece of the shape as shown in Fig. 196 had to be produced. If a piece had to be produced such as is shown in Fig. 197, it would no longer be possible to move one of the slides by means of a screw. The distances AA_1, A_1A_2, A_2A_3, are again equal. At A_2 the other slide must move from the point B_2 to B_3 without any further movement of the first slide; which, of course, would be an impossibility because the speed would be infinitely large in the direction of B_1B_2.

If cams were used, all that would be necessary would be to have a part of the A cam made with a dwell, while a part of the B cam makes the piece travel from B_1 to B_2. Similarly, it is not possible to have a screw produce the movements in the B direction because in that case there would have to be an infinite speed in the A direction while the contour is made between C_1 and C_2. Generally speaking, an ordinary feed such as the screw feed can be used in combination with a cam feed when there is never a large ratio between ordinates and abcissae, such as is the case with the contour shown in Fig. 196, but it becomes impossible when this ratio becomes large. Even if the branch B_1B_2 in Fig. 197 had not been vertical but merely a steep slope, a screw could not have been used in combination with a cam.

Making a piece to an irregular contour is generally accomplished by the process of milling though, in a few cases, it is done by slotting, shaping or planing. When an irregular piece is produced by milling, the size of cutter which is to be used should be considered in the laying out of templet or cam. Referring again to Fig. 197 it will be seen that if the cutter which is actually used should be smaller than the cutter which was considered when the cam were laid out, then the branch B_1B_2 would come too far to the left, and the other vertical branch too far to the right; whereas the horizontal branches would also have been spread apart. Altogether, the piece would have been distorted. As a rule the desired accuracy in a piece is not so great but that a small variation in the size of the cutter can be allowed.

Generally speaking, in automatic contour milling we will meet the same conditions as in profiling on a hand operated machine. In the latter type of machines the trouble is sometimes overcome by making the guide pin or tracer taper, so that it is always possible to have such a diameter of the tracer bear against the templet as corresponds to the diameter of the cutter used. This method could not be followed in automatic profiling, because there is no tracer in this case.

When disk cams are used and the roller is always held against the cam, say, by a weight, we might make the roller taper, but then it would bear against an edge of the cam only, and this would not be practical except for the lightest kind of work. Another method is also

sometimes followed in profiling, and that is that two cutters are used to make the piece, one for roughing, the other for finishing. Wear in the roughing cutter is compensated for by the finishing cut, and wear in the finishing cutter is, of course, very small. Thus, a great many pieces can be made with this finishing cutter before it will be necessary to re-sharpen it. A small amount of variation in this finishing cutter is, of course, permissible, let us say a few thousandths, and after it has become too small to be of further use as a finishing cutter, it can be used as a roughing cutter. This method can be employed with automatic milling, but, naturally, only when two cuts are taken.

Advantages and Disadvantages of Cams

Cams offer unlimited possibilities as to the nature and combinations of motions of machine elements. It would be perfectly possible, for instance, to have one's signature produced by a pen by the movement of two slides guided by two cams. There is hardly any kind of movement imaginable, either in one plane or in space, which cannot be produced by cams, and when once the cams are designed the simplest kind of mechanism is, as a rule, sufficient to drive them. Other advantages have already been mentioned, such as the fact that they provide a definite limit of stroke without danger of over-run, that they will give variable speed or motion in opposite directions without complicated mechanism or without reversal of parts, in fact, the advantages of cams are so many and so well recognized that they are often used where other mechanism might have been employed to better advantage.

Like everything else, a cam has its disadvantages as well as its good points. There is, in the first place, its limited capacity as to power or pressure. Generally speaking, cams are not well adapted to heavy duty machines. In the second place, they take large dimensions as a rule and are not easy to place in a covered mechanism. Another disadvantage is that they are limited in their scope. It is easy enough to construct a cam to give a movement of 6 in. but not of 6 ft. Not only that, but it is not possible to produce anything else but 6 in. unless additional mechanism, such as levers, etc., are introduced. Finally, there is the difficulty of making the cam. There is, at the present time, no means of generating a cam, though there is no reason why a generating machine could not be made for certain classes of cams.

Economy Justifies Making of Tracings

By S. N. Bacon

The writer has often observed the almost universal practice followed in small shops and factories where only one or two draftsmen are employed, of using the heavy or "cream" drawing paper for the drafting of patterns, punches, dies, miscellaneous tools and sometimes parts for manufacture. Most draftsmen and tool designers agree that practically the only advantage of this material over the bond and vellum papers is its erasing qualities, the medium grade being about the same in price. The idea of saving the cost of the blueprint, the writer believes to be mistaken economy.

Its disadvantages are several. In making the drawing, quite frequently time could be saved if partial views were traced from other drawings, or the outline of the work were traced as is usually done in jig and fixture design. Then again, it is sometimes convenient to trace a part from the reverse side to change it from right-hand to left-hand. Another disadvantage is the necessity of sending the original drawing to the pattern shop or toolroom, which leaves the designer without a copy for reference; this procedure is especially inconvenient when the work is done by outside shops.

Dirt May Be Dangerous

It is not easy to keep these cream-colored drawings clean in the factory, and the danger of mistakes arising from thumb-printed dimensions is not an imaginary one. It is disagreeable to handle these drawings after they return from the shop, not because the designer is so adverse to getting his hands soiled, but because the sheets are usually very much soiled on the reserve side with black grease due to laying the drawings on the work bench. Thus, when referring to the old drawings, new drawings in the course of preparation are soiled.

Manufacturers of drafting supplies have been furnishing for some years a fairly tough grade of vellum or tracing paper which is equally as transparent as linen tracing cloth and much lower in price. Erasing pencil marks from this material is not difficult if the designs are made with a pencil not harder than 4H. Ink should seldom be used on vellum, as a satisfactory blueprint can be made from the pencil tracing.

Drawings requiring more than two or three days to complete should be traced on linen and blueprints of them, especially from tracings of parts to be manufactured, should be filed in a fireproof vault so that in case of fire no time would be lost in replacing tools and equipment, and the expense of designing all over again would be eliminated. The above economies will more than pay for the cost of blueprinting.

Personality and Pessimism

By Charles W. Lee

I was once severely criticized by a professional optimist. He said that I was a pessimist, that pessimists were all wrong, and that I was harming not only myself but the world at large. After much more in the same strain he demanded to know how I happened to be a pessimist anyhow.

My reply was that if I were a pessimist it was probably because I had designed so much machinery—although possibly it was the other way around—and that no one not a pessimist could be a good machine designer because the first thing necessary after completing a design was to say (quoting good old John Fritz): "Now let's go and find out what's the matter with it."

And that goes!

The most ingenious machine designer I ever knew was also the greatest optimist. He never could see anything the matter with his designs, so it always fell to me to go through the drawings and pick out the "bugs" that were always there, I being only a poor pessimist who could see a bug across the room.

Incidentally the optimist received a much larger salary than the pessimist, which leads me to believe that my critic was right when he said I was harming myself, but I still contend that I was not harming the world.

And anyhow I claim to be neither an optimist nor a pessimist but a rationalist, because I picked only the bugs out of the optimist's drawings, seeing the good and letting it remain. After all, a pessimist is only "one who has to live with optimists."

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Errors in Checking Cylindrical Work in V-Blocks

BY A. H. FRAUENTHAL

The writer was recently in discussion with the manufacturer of a rather well-known amplifying gage concerning the application of the V-block in measuring

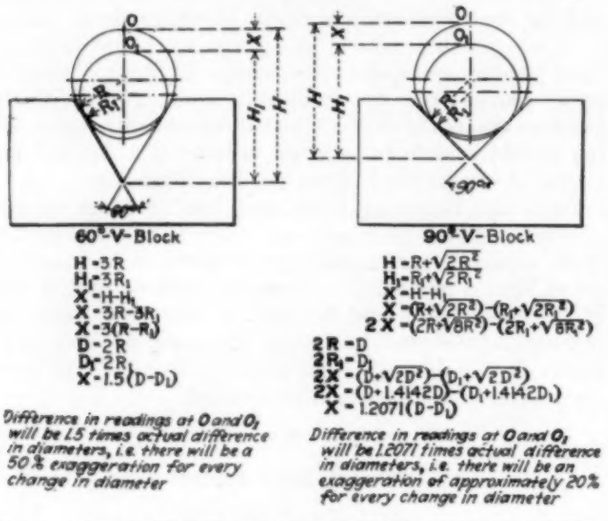

60° V-Block
H = 3R
H1 = 3R1
X = H - H1
X = 3R - 3R1
X = 3(R - R1)
D = 2R
D1 = 2R1
X = 1.5(D - D1)
Difference in readings at O and O1 will be 1.5 times actual difference in diameters, i.e. there will be a 50% exaggeration for every change in diameter
90° V-Block
H = R + √2R²
H1 = R1 + √2R1²
X = H - H1
X = (R + √2R²) - (R1 + √2R1²)
2X = (2R + √8R²) - (2R1 + √8R1²)
2R = D
2R1 = D1
2X = (D + √2D²) - (D1 + √2D²)
2X = (D + 1.4142D) - (D1 + 1.4142D1)
X = 1.2071(D - D1)
Difference in readings at O and O1 will be 1.2071 times actual difference in diameters, i.e. there will be an exaggeration of approximately 20% for every change in diameter

FIG. 1—HOW VARIATIONS IN DIAMETER ARE EXAGGERATED ON WORK CHECKED IN V-BLOCKS

size variation and roundness of cylindrical objects, and was very much surprised to note that the gentleman in question was not conversant with the fact that the ordinary V-blocks in general use, and similar to the V-blocks on some of his own machines, greatly exaggerate both variation of size and amount of out-of-roundness, particularly on centerless-grinding work. I am, therefore, sending you this article which may be of help to others who have never considered the error in this method of checking.

Herewith, in Fig. 1, is a sketch, also figures showing

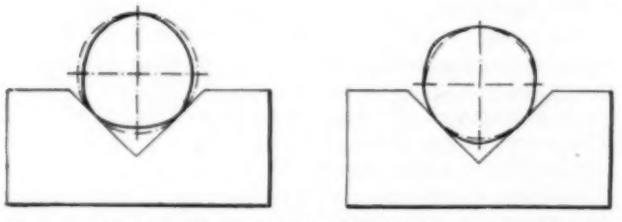


FIG. 2—ANALYZING TRIANGULAR OUT OF ROUNDNESS

the error of exaggeration in both 60- and 90-deg. angle V-blocks. This explanation shows the magnification of variation in diameter and it can readily be seen by the sketches of triangularly out of round cylinders in V-blocks in Fig. 2 that the measuring of out-of-roundness of a triangularly shaped piece is nothing more or less than the comparison of size of the inscribed and circumscribed circles of the triangle.

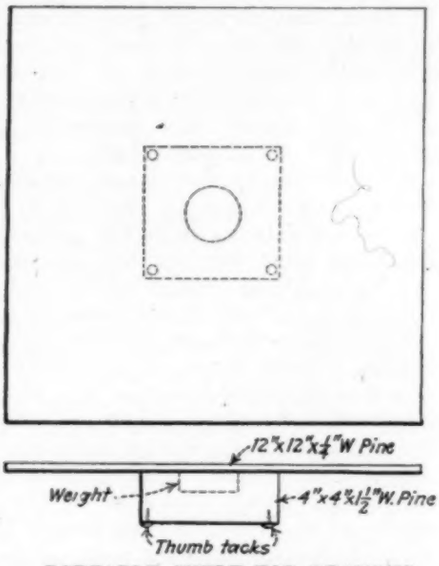
It is, of course, understood that the out-of-roundness produced on a centerless-grinding machine is generally triangular and always a multiple of three.

Drafting Room Kink

BY H. R. BOWMAN

When working on a drawing table where no shelves are available, the drawing instruments are usually spread all over the board, either out of reach or in the way of the T-square and triangles.

I made a portable shelf by fastening a piece of board to a block of wood as shown in the sketch herewith. The instruments are placed upon it and it can be moved to any position on the board on which the draftsman is working. An iron weight may be inserted to give stability but is not absolutely necessary. The thumbtacks on which it rests keep the wood from soiling the paper. If the table is slanting, the block may be cut at a corresponding angle so that the shelf will be level.



PORTABLE SHELF FOR DRAWING INSTRUMENTS

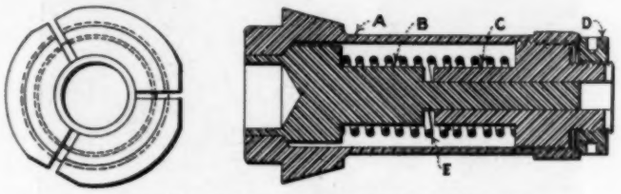
Finishing Spring Collet for Screw Machine

BY I. BERNARD BLACK

In the following article is described and illustrated a finishing spring collet designed for use in a No. 0, B. & S. automatic screw machine for finishing the inside diameter of gold rings after they had been blanked out by a punch press. In this particular design the spring collet takes rings from 3/32 to 1/8 in. in width. The outside diameter of the rings is 0.700 in. and the inside diameter when finished 0.550 inch.

A noval feature of this spring collet is the ejecting principle. The rings are fed into the spring collet by means of a magazine attached to the front cross-slide of the machine, and a push finger in the turret head. The machine is so set that when the inside diameter of the

ring has been finished by the tool in the turret head, the chucking mechanism will cause the collet sleeve (which is tapered and slides over the collet in the spindle) to draw back, thus opening the spring collet. The grip on the ring being released, the spring plunger *B* will eject the ring and so be ready to take the next ring fed to it by the magazine and turret. For each ring width, however, the spring collet has to be set, that



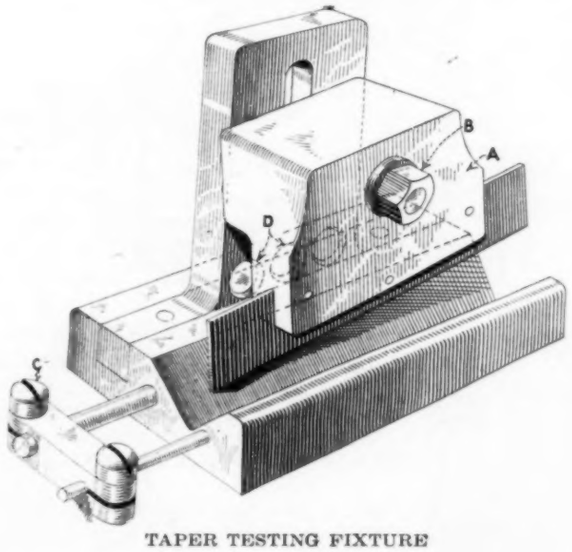
SPRING COLLET FOR HOLDING RINGS

is, the part *C* must either be screwed in or out and then locked in place by the part *D*, so that the distance between parts *B* and *C* will be the same as the ring width. In the illustration, part *A* is a standard single-angle spring collet for No. 0, B. & S. automatic screw machine and is made of tool steel, hardened and tempered. The part *B* is made of tool steel, hardened, and made a sliding fit in parts *A* and *C*. Part *C* is made of tool steel, hardened and has a slot machined on the end as shown to assist in adjusting. Part *D* is a nut made of tool steel and hardened. Part *E* is a steel spring made to suit.

Adjustable Taper Testing Fixture

BY EDWARD J. RANTSCH

The accompanying sketch shows an adjustable taper testing fixture in which the important points are: the three-point contact with the work, the adjustment covering a great range of sizes, and the adjustable gage



TAPER TESTING FIXTURE

which can be set at one end of the sample to be reproduced.

All that is necessary when setting the fixture to a given taper is to lay a taper gage or a sample of the taper to be gaged in the V-block, bring down the adjustable head *A* against the sample and secure it in position by tightening the nut *B*. Then the gage *C* should be brought against the end of the taper gage or sample, the taper of which is to be reproduced.

The fixture once adjusted, may be kept at the lathe where the taper is being turned and no time need be lost in going back and forth to try the taper in the spindle of the machine it is to fit. Neither will it be necessary to keep a valuable machine idle while a taper is being turned and fitted to its spindle.

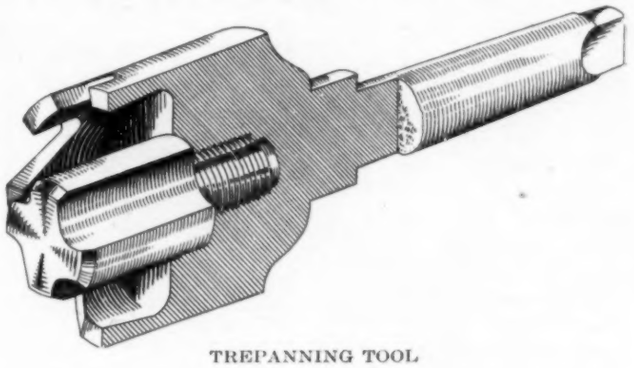
The holes *D* in the standard are for the purpose of letting in light, so as to see that the edge of the adjustable head makes proper contact with the sample or work.

Trepanning Tool for Flue Sheet

BY LOUIS E. REIBEL

In applying superheaters to locomotives it is necessary to change the flue sheets. In making the new sheets, the 4$\frac{33}{64}$-in. holes for the superheater flues were put in by first punching 1-in. holes, then enlarging them to 2$\frac{1}{2}$ in. by drilling and finally bringing them to size in a horizontal boring mill.

As the time required for doing the work in the above



TREPANNING TOOL

manner was excessive, I made the trepanning tool shown in the sketch herewith and its use reduced the time fully 70 per cent.

The tool is 4$\frac{1}{2}$ in. in diameter and has six cutting teeth, each $\frac{1}{16}$ in. thick. The 2-in. pilot is in the form of a reamer and is screwed into the shank of the tool as shown.

Limitation of Piston Aligning Gages —Discussion

BY CHARLES G. LIENDECKER

Referring to page 659, Vol. 57, of the *American Machinist*, I note an article under the above title by J. T. Towlson, London, England. I have been experimenting with such a ball and socket piston head as described by Mr. Towlson for the last six months, having made up four pistons and tried them out in a Ford. I was under the impression that crystallization would take place where the ball joins the connecting rod.

I made one ball-connected piston and connecting rod complete about sixteen months ago and sent them to the Chandler Motor Car Co. for its engineers to pass judgment upon. They corroborated my opinion that the connecting rod would probably crystallize back of the ball. However, I determined to try out a piston and rod of such construction and they are still running and the ball and socket joint does not seem to be worn to any great extent. I have $\frac{1}{16}$ in. of laminations of 0.002 in. thickness between the bronze socket and

cap for adjustment, which a piston of the cross head-pin type does not have. Neither is there any way to take up wear on the present type of gas engine piston-head and pin.

It would seem as though the gas engine manufacturers, especially the makers of stationary gas engines, ought to look into this construction as it is a great improvement, as I know after seeing the many scored cylinders caused by the piston pins coming out against the walls. In my opinion, it is the proper connection for the piston and a connecting rod of a gas engine.

Special Hobbing Attachment

BY O. S. MARSHALL

The special fixture here described is one recently devised and applied to a Gould & Eberhardt hobbing machine in the works of the Jones & Lamson Machine Company. Its purpose is for effecting an angular movement of the cutter-spindle head during cutting operation on certain jobs.

One particular job for which this attachment is used is a worm-wheel that is hobbed for both a right and a left hand worm, half the tooth-width being for right hand, and half for left hand. The worm for this wheel to be seen with the gear in Fig. 1 has right and left hand threads cut on opposite ends. When it is desired to shift from right to left hand feed or vice versa, the worm is moved longitudinally from one position to the other and held in either position by a controlling lever.

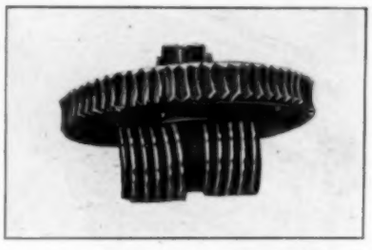


FIG. 1—RIGHT AND LEFT HAND WORM AND WHEEL

The production method for this worm-wheel had been to hob all the blanks in the lot with a hob of one hand and then run the lot through again, using a hob of the opposite hand in the second operation. A little experimenting revealed that both operations could be performed with the same hob without materially affecting the tooth-form and merely required rotating the cutter-spindle head angularly until the correct lead angle was obtained. The time was greatly reduced also. The machine could be set up for either a right or a left hand hob, the work, of course, rotating in accordance with the lead of the hob to be used. The cutting operation consists in feeding the blank into the hob the required depth in the regular manner. When the wheel has been hobbed to suit a worm having a lead in one direction, the cutter-spindle head is given the required angular movement to hob the wheel to suit a worm having a lead in the opposite direction. Both hobbings are done without stopping the machine or backing the work away until the two operations are completed, or both right and left tooth forms are cut.

The parts in Figs. 2 and 3 have the same reference letters. The worm-wheel segment *A* is attached to the cutter-spindle head, *B*, by means of supports as at *C* and so that its pitch line is coincident with the central pivot of the cutter-spindle head *B*. The worm *D* is carried by the housing-block *E*, firmly attached to the vertical slide *G*, which carries the cutter-spindle head. A stop, set in the segment *A* (in conjunction with adjustable stop screws), limits the amount of angular movement of the cutter-spindle head.

It will be observed that the worm-wheel segment *A* moves with the cutter-spindle head and is necessarily limited in the amount of possible travel, but this

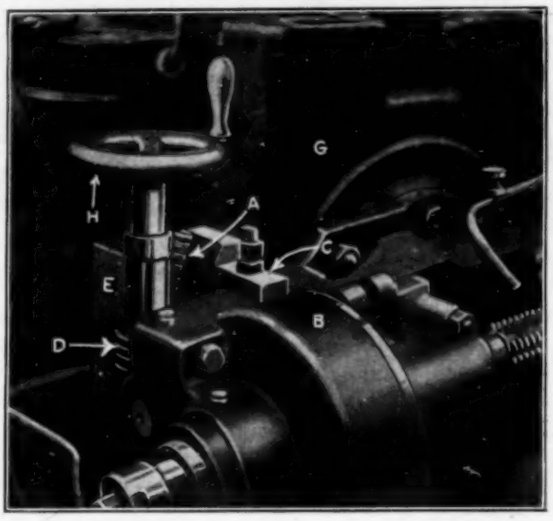


FIG. 2—THE ATTACHMENT ON THE MACHINE

amount is sufficient for all ordinary uses. The worm is carefully seated to avoid backlash. The device is manipulated by means of the handwheel *H*, the proper amount of angular rotation being governed by adjustable stop-screws. It is necessary to free the clamping bolts of the cutter-spindle head slightly to permit its responding to the action of the worm, the practice be-

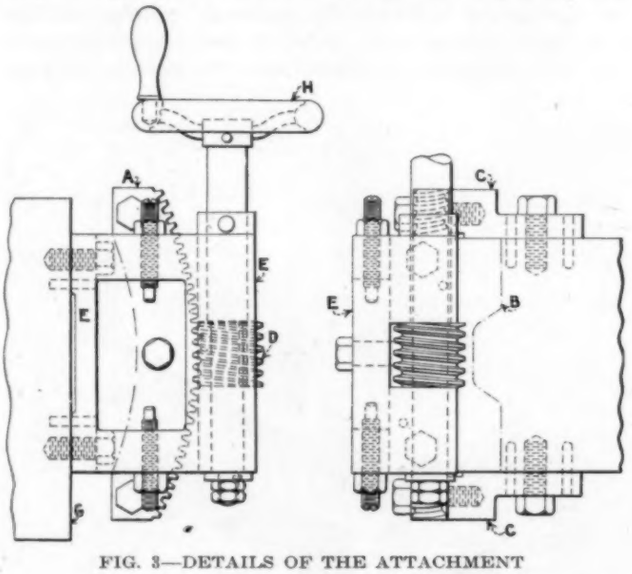


FIG. 3—DETAILS OF THE ATTACHMENT

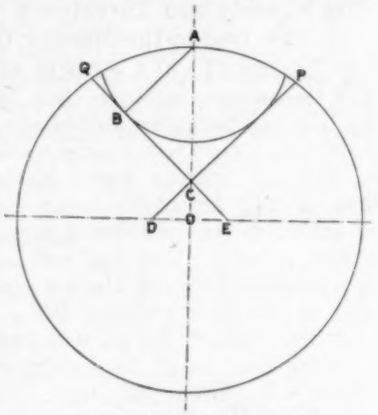
ing to leave one bolt at the top tightened during the in-feed, releasing it slightly while the operator manipulates the attachment.

The fixture has proved its value in repeated production jobs. When spiral gears of extreme angle come to the machine for generating, the attachment is removed. It can readily be attached or detached at any time and as the parts to be fitted to the machine are fitted with dowel pins, their proper location is easily determined.

A Problem in Shop Trigonometry

By M. Tolliver

The problem given and solved by J. Rantsch, which appeared on page 733 of *American Machinist*, is —. That's it. What is it? What does he want to find? When I went to school I was taught that the first step in solving a problem was stating it. So far I have not been able to find what Mr. Rantsch wanted to do, and not knowing this I am not able to say whether the solution fits it or not. Supposing, however, that he wants to cut the right-angle groove, and its outline must be marked off on the piece, it seems to me that he does a whole lot of things which might be left undone, and this is a sin second only to not doing the things which should be done.



A PROBLEM IN SHOP TRIGONOMETRY

If the problem is merely that of scribing the outline of the groove I would work it out as follows:

As $AB = \frac{11}{16}$ and the angle $ACB = 45$ deg., the line $AC = \frac{11}{16} \times 1.4142 = 0.663$. Subtracting this from the radius AO, we find

$$CO = 0.9375 - 0.663 = 0.2745$$

As OD and OE are both equal to OC, we can lay out the three points C, D and E and draw the lines DCP and ECQ, which winds up our problem.

A Large Repair Job in a Small Lathe

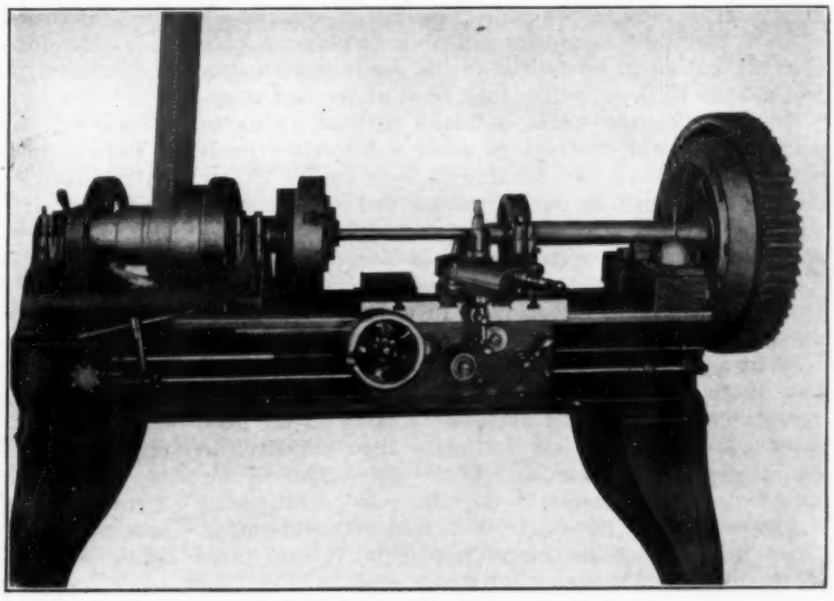
By George Wilson

The drum shaft, clutch, and gear from a hoisting engine were in the shop for repairs, having become damaged by an accident to the clutch mechanism. The repair involved the turning of a shoulder and cutting a new thread on the end of the shaft opposite the gear.

The first thought was, as a matter of course, to get the gear and clutch ring off so that the shaft could be placed between centers, but these parts were keyed very solidly in place and, as we learned that a similar shaft had been ruined beyond repair in an attempt to remove the gear, we changed our minds and decided to devise a way to do the work without taking the gear off. The illustrations show how the work was done.

There was an axial hole in the small end of the shaft about $\frac{7}{8}$ in. in diameter and 5 in. deep, and this circumstance aided us materially in the set-up. A bar of machine steel was first put on centers in the lathe and shouldered down at one end to a drive fit in this hole. The shaft was then placed in the lathe with the gear overhanging the bed—the tailstock having been removed for the purpose—the end of the extension caught in the lathe chuck and the weight of the gear supported by a large V-block carefully packed up to the right height.

The steady rest of the lathe furnished a support for the shaft close to where the cuts were being taken. We were thus able to complete the turning and threading almost as readily as if the gear had been removed.



LARGE REPAIR JOB IN SMALL LATHE

Locating Cutters in a Boring Bar

By William J. Thirkettle

Some time ago I had occasion to bore a number of holes in a rather awkward set of castings and the only machine available for the boring was a radial drilling machine. Owing to the peculiar shape of the castings, the position of the holes and the absence of several movements that would be found in any standard boring mill, it was necessary to leave the bar in place after a casting was set up until all the holes in that casting had been bored.

As it would have been difficult indeed to obtain a measurement of any kind to assist in resetting the cutters with the bar in place I was obliged to devise some way to return them to exact position after each resetting.

The cutters were round pieces of tool steel fitted to transverse holes in the bar and held in place by setscrews. In making up these cutters I first drilled and countersunk a conical cavity—like a center hole—in one side of each cutter midway of its length. Setting them in place with the cavities opposite the respective setscrew holes in the bar, I dropped a small steel ball in each and followed it with a cup-pointed screw.

Thus held, I put the bar on centers in a lathe, turned the cutters to their respective diameters, removed and hardened them and returned them to place for grinding and relieving. I could now take out the cutters at any time for sharpening and return them to their respective places with assurance that the little ball would locate them accurately to cut the correct diameters.

Boring bars, fitted with interchangeable cutters as described in the preceding paragraphs, will always be found useful in shops where much boring is to be done.

Editorial

THE OLD IDEA of putting all the best furniture in the parlor, protecting it with slip covers and locking the door to open it only in case of a funeral, is pretty nearly obsolete at this date. But to buy nice machinery and then pamper it for fear it may wear out is still quite common. What is the good of chairs except to sit on them, and what is the use of machinery except to produce with it?

The Honor and Responsibility of Being an American

AT THE TIME of year when sentiment is uppermost in the hearts of men it is a gratifying feeling to know that you are respected, trusted and loved by some at least of the people in this unhappy world. One of the best features of this feeling of gratification is that it stimulates one to be worthy of the gratitude and to strive to earn more of it. There is also a responsibility to remain true to the ideals that have led one on which has a sobering influence.

We have recently had the pleasure of hearing from an American Relief Association officer what the Russian thinks of the American, from an eminent mining engineer formerly employed by the Turkish government what the Turk thinks of the American, from a Chinese merchant and from an American worker in a Chinese school what the Chinese thinks of the American, and from the secretary of the A.S.M.E. what the South American thinks of the North American engineer.

In Russia, we learn, the A.R.A. has not only filled the stomachs of the people and broken the famine but has helped these desperate people to regain their grip. They look on Americans as a people apart, a people to be trusted and to be emulated.

To the Turk we appear as the only Christian nation that does not have a feverish desire to exploit him or his country. He has had rather unpleasant experiences with his European neighbors and while he may not have been all that could be desired in his dealings with subject peoples he is not worse than most of the rest of us.

China looks upon us as a friend without an ax to grind, a pleasant contrast to other ostensible friends with concessionary bees buzzing in their bonnets. Our medical missionaries, our educators and our financial advisers have paved the way for friendship which the square dealing of our statesmen has helped to confirm.

The South Americans are sending more of their boys to the United States each year to learn something of our ideals of integrity, efficiency and right living.

What a grave responsibility rests on our shoulders to live up to this admiration and respect. But what a wonderful opportunity it presents to carry on the good work and help those less fortunate than ourselves to help themselves to their place in the sun. That we may be able to realize on this friendship by establishing commercial relations should be a minor consideration. If we take care of the moral responsibility that faces us, in the true Christmas spirit, we need have no fear that our reward will not come along in due course.

Ship Subsidy Bill Threatened by Dog-in-the-Manger Opposition

A REGRETTABLE SPIRIT of envy, a mean dog-in-the-manger attitude, has been responsible lately for holding back the fulfillment of many worth-while projects. There was a time when success and progress in men and nations was a matter of admiration. So long as their prosperity was not secured at the expense of others it was considered commendable.

But recently there has been a change of face. It has reached its most absurd expression in the opposition to the Ship Subsidy Bill. The argument is not that the United States will suffer loss of money or prestige because of its enactment, nor that other nations will suffer, but that certain individuals may benefit.

It is not claimed that the country will lose, but the fact that some people may gain—legitimately—rankles in the minds of the envious. The knowledge that their stubbornness may work havoc to the country means nothing to them.

A certain amount of perversity and blindness on any large issue is to be expected, but when a bushel of coin is refused because some one else may get a grain or two, it is time to do something strenuous. There is little doubt that the United States will benefit by the bill. Then by all means consider the good of the nation! If certain individuals also benefit, so much the better.

It Pays to Keep Up With the Procession

A RECENT BULLETIN from the general manager of the National Machine Tool Builders' Association called attention to a situation that has serious possibilities. It has to do with the standardization movement.

The bulletin discusses a communication from the Chief of Ordnance to the American Engineering Standards Committee recommending that steps be taken to standardize certain machine tool parts and accessories. The letter incloses a list of standards as adopted at the Watertown Arsenal.

Here is the point. If the builders of machine tools do not take an active interest in standardization and present their side of the case in committee meetings that may be called, it is a certainty that the big users will go ahead without them and lay down certain specifications that may be embarrassing to meet.

Another possibility is that the users of machine tools in various important industries may not be able to get together but may go ahead on independent lines, each establishing standards of its own that differ from those of all the rest. For instance, the General Electric Co. might decide that T-slots of certain dimensions should be used on all milling machines of a certain size throughout its several plants. General Motors might take a similar position and say that a standard T-slot of a different size should be used on the milling machines in the Cadillac, Buick, Oldsmobile, Oakland and Chevrolet plants. The Singer Mfg. Co. might es-

tablish still a third standard for its Bridgeport, Elizabethport and South Bend shops. Any one or all three of these standards might require extensive re-designing and re-tooling on the part of every machine tool builder who wanted to bid for business from these companies. And all because the builder refused to sit in and meet the ideas of the customer half-way.

It is a footless argument to contend that the customer must take what the manufacturer chooses to offer him. In the first place there would probably be some manufacturer hungry enough for the business of such big houses to build a product to meet their specifications. In the second place organizations like the ones mentioned could build their own tools to their own standards if they had to. The extra cost would be counterbalanced by the savings due to the standardization of small tools thus made possible.

As a matter of fact the question never would have come up at all if the builders had got together and established standards of their own for the work and tool holding elements of their machines. In that case the users could have used one expensive cutter on each of several milling machines of different makes as the occasion arose, instead of being forced to buy a different cutter for each machine.

All this is very unpleasant to think about and quite unnecessary if the men concerned will only recognize that a real procession has started and go with it. It is a procession that will lead to economic and scientific improvement for every one. Why not join in and help a good thing along?

Vindication of Langley's Airplane Design

TWENTY-SIX years ago Prof. Langley made the second successful flight with his steam driven "aerodrome" model which flew for nearly two minutes and covered about three-quarters of a mile. The trial of the full sized machine in 1903 and its failure due to the landing device, stopped the funds from the War Department and experiments ceased. Three years later Prof. Langley died, largely as the result of hostile criticism and ridicule at this failure.

Yet, perhaps more than anyone else, Langley had worked out the correct theory for planes. His critics and defamers who are still alive must be chagrined to find that the winning glider in the recent competition in England, built by Peyret, is very similar to the monoplane designed by Langley and is credited to him by Peyret himself.

It is to be regretted that Prof. Langley could not have lived to see the airplane of today and to see his own machine flown by Glenn Curtiss in 1914 with its original engine (built largely by Manly), even with the addition of 300 pounds of weight in the shape of pontoons.

All this goes to show how thoroughly American the airplane really is and should inspire us all to aid in its development in the country of its inception. It has long since passed the experimental stage—it now needs to be encouraged by the establishment of landing fields in every city and town and by its use for commercial purposes whenever possible. The growth of the aircraft industry depends largely on popular interest in aviation and each one can help in his own community.

Airplanes are mechanical devices and require machine tools and machinists for their construction and maintenance.

The Trend Toward Simple Machines

THERE SEEMS to be little doubt that the demand, we might almost say craze, for strictly single-purpose machine tools is decidedly on the wane. Just how much of it was justified and how much was a total economic waste, we shall never know. But it is good to know that we are getting back on a more rational basis.

There is, however, a decided tendency on the part of large users of machine tools, such as the automobile builders, to demand *simple* machine tools. Not for machining a single piece, but to perform a simple operation, such as gear cutting, on a simple machine.

Taking gear cutting as an example we find this simplification being forced on the builders instead of being inaugurated by them. The demand for quiet gears in automobile transmissions has led to exhaustive study and experiment in the endeavor to secure gears which are concentric and with correct spacing and tooth form. It has been shown that gears vary slightly from time to time on the same machine. This has been traced in some cases to slight defects in the gears in the machine itself.

Realizing more and more the impossibility of securing perfection in gearing one of the large motor companies built a gear-cutting machine with only four gears in the whole machine. The bearings are large and rigid and the whole machine is as free from spring and vibration as they could possibly make it. It is not a universal machine but it will handle such gears as are found in automobile transmissions, and is not in any sense a single piece machine. The four gears in the machine are made as accurately as possible and the results have been very gratifying. The four gears replace from twenty-seven to thirty-five gears in the commercial machines, these being used to give the machine a wider range of work.

The automobile builder in question has no desire to go into the building of machine tools, and has commissioned several builders of gear-cutting machines to build machines of this simple design. The simplification of machine tools for manufacturing shops is a step in the right direction. There will, of course, always be a demand for a more universal machine for shops doing work in smaller quantities. But the eliminations of gears and bearings must have an effect on securing more accurate work and the first cost of the machine may be somewhat lower.

Just Suppose

JUST suppose that you hired a staff of engineers to travel about the country—or even abroad occasionally—so that they could study the latest methods of doing machine work in the most economical manner.

Suppose they sent you a weekly report, illustrated with photographs or drawings that showed just how the other fellow did it? You'd be pretty sure to find some interesting and valuable information in these reports, information that would save you dollars and dollars every year.

Just suppose you let these reports stay unopened on your desk as you sometimes do copies of the best technical papers, because you thought you didn't have time to read them. *You* probably don't neglect any opportunity to secure new and worth while data, but—

Just suppose.

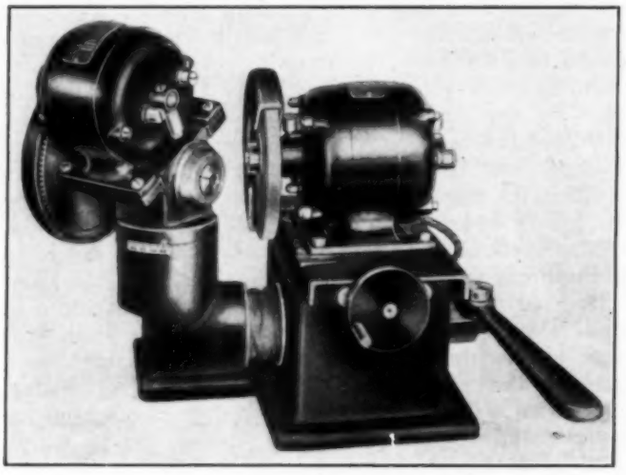
Shop Equipment News

Fleming Valve and Reamer Grinding Machine

The Fleming Machine Co., Springfield, Mass., has placed upon the market the electrically driven machine herewith illustrated for grinding the valves of automotive engines, and also for grinding the valve seating reamers used in connection with them. The device needs but to be connected with any convenient lamp socket to be ready for service.

A ½-hp. ball-bearing motor, mounted upon a slide rest that has screw-adjusted movement in one direction and a hand-lever-operated movement in the other, drives a 6-in. diameter, ⅜-in. face grinding wheel at a peripheral speed of 5,200 ft. per minute. A 1/20-hp. motor upon the swiveling work head drives the work spindle through speed-reduction gearing. The work is held in spring collets having a maximum capacity of ¾ in. round.

The swivelling work head adapts the device to grind



FLEMING VALVE GRINDING MACHINE

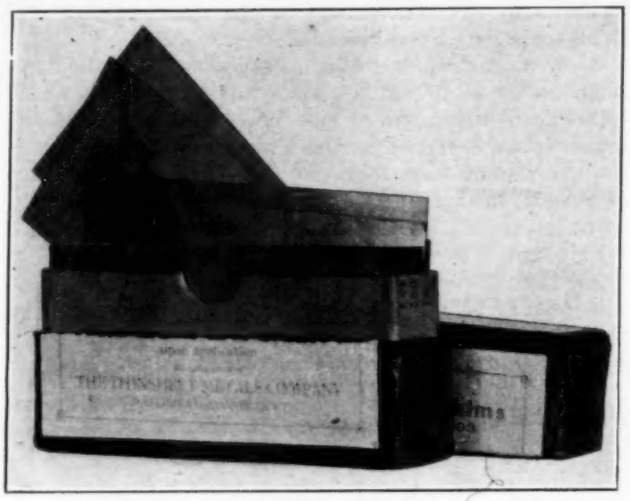
any angle with which the valves of commercial engines are made, and it is easily and quickly adjusted to the desired angle by means of a sector graduated in degrees. Valve seating reamers and the corresponding valves may be ground without disturbing the setting, so that the correct seating of the valve is assured.

Boxed for shipment the device weighs approximately 100 pounds.

Thinsheet Brass Shims

In order to provide the utmost in convenience and economy where small brass shims are required, the Thinsheet Metals Co., Waterbury, Conn., has just placed on the market boxes of brass shims such as illustrated herewith. Each box contains 150 sheets 2 x 4 in. in size, with three thicknesses of 0.001, 0.002 and 0.003 in. The different sizes are kept separate in the box, so that they can be easily reached. The size of the box makes it suitable for use both at the bench or in a tool kit to be carried to the job.

The small sheets are more convenient to use than where it is necessary to cut shims from a large sheet. The waste is reduced, it is stated, as this factor is very often large when shims are cut from a sheet, even

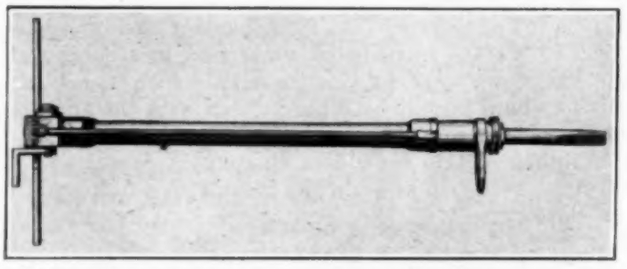


THINSHEET BRASS SHIMS

though care be taken. Strip metal, although economical to use, is not always convenient for the reason that rolls of brass of various thickness are not generally available at each bench and cannot well be carried to repair jobs away from the shop.

"Boyer Superior" Pneumatic Rivet Cutter

Working on the principle that when cutting rivets, a number of comparatively light, rapid blows cause more vibration and therefore more distortion of steel plates than a few intermittent, heavy blows, the Chicago Pneumatic Tool Co., New York, N. Y., has recently designed and placed on the market a type of pneumatically



"BOYER SUPERIOR" PNEUMATIC RIVET CUTTER

operated rivet cutter designated as the "Boyer Superior."

The construction of the device is shown in the accompanying illustration. The tool consists of a dead handle for holding the machine, a throttle handle of the crank design, a throttle valve of the taper type, a back head

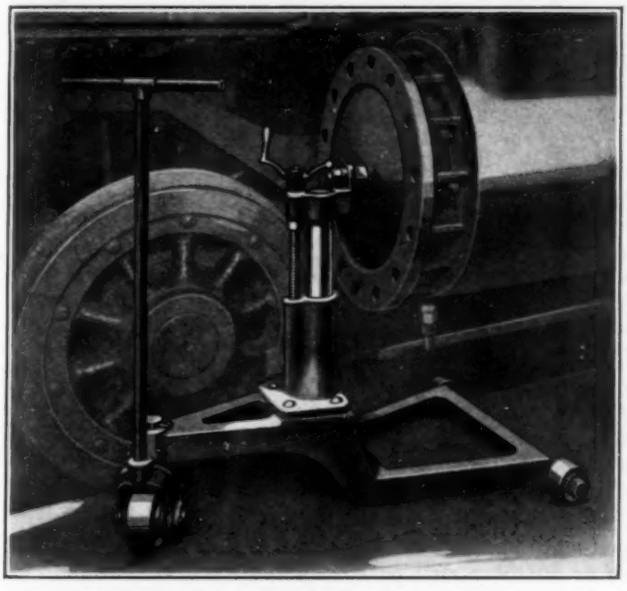
screwed onto the cylinder and secured by a locking device, a cushion chamber in the rear end of the cylinder, a cylinder of seamless steel tubing, a bypass from back to front head, a non-removable electrically welded front head, square coiled spring buffer, adjustable chisel lock, hand hold of the spade handle type, and a chisel.

To operate the cutter, the throttle handle is moved in a line parallel with the cylinder. Each forward and return stroke of the piston is hand controlled. About four blows, requiring approximately 10 to 15 sec., are said to be required to cut off the head of a ¾-in. rivet. Two men are needed to operate the machine.

"Viloco" Portable Cylinder-Head Crane

A portable crane or truck for use in the removal and replacement of locomotive cylinder heads and crossheads has recently been placed on the market by Harry Vissering & Co., Chicago and Benton Harbor, Ill., under the trade name of "Viloco." The accompanying illustration shows the device, which is suitable for all classes of locomotives and can be employed for moving the cylinder head to any part of the shop desired.

The frame of the truck, which provides a center distance of 32½ in. between the front and the rear wheels and of 21 in. between the two rear wheels, carries a vertical steel column to which the cylinder heads can be



"VILOCO" PORTABLE CYLINDER-HEAD CRANE

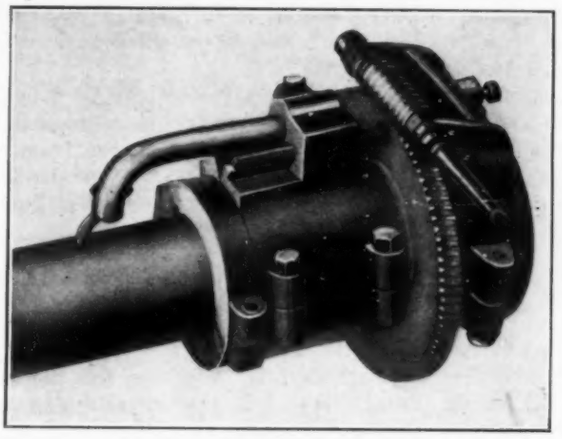
secured. The column is 2⅜ in. in diameter, and can be adjusted by means of a screw having a pitch of 7 threads per inch. By means of the lever at the top of the column, the screw can be turned to vary the height of the head, the maximum height of the bolt carrying the work being 36 in. above the floor.

The handle for pulling and steering the truck is made of pipe and is connected to the front wheel in such a manner that the weight of the truck keeps the handle in a vertical position when the truck is not being pulled. Lowering the handle causes a slight raising of the truck frame, so that a quick adjustment of the height of the work can be easily obtained. The advantage of this construction is that the cylinder head can be easily raised or lowered to the level required to clear the studs when placing it on the cylinder.

Device for Truing Journals on Locomotive Axles

C. E. Marsh, 324 Hemphill Ave., Atlanta, Ga., has recently brought out the device for truing journals on locomotive axles shown in the accompanying illustration.

The device, including the worm wheel, is made in halves so it can be clamped about the axle. At one



MARSH'S AXLE TRUING DEVICE

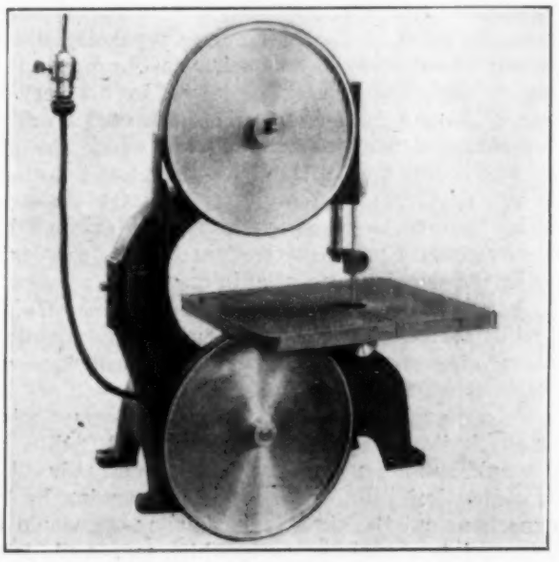
end of the worm shaft is a standard taper shank by which the device may be driven from an air drill or electric motor fitted with a taper socket.

The cutting tool is inserted in the tool arm as shown and may be made of any kind of steel or of any shape desired. The block carrying the tool arm is fitted to a dovetail slide and the feed is by a screw. Three changes of feed in either direction are provided.

The device is portable and its use obviates the necessity of swinging an axle with its wheels into a driving wheel lathe to true the journals.

Jarvis Electric Bench Band Sawing Machine

The accompanying illustration shows an electric-driven band sawing machine for general use such as encountered in a pattern shop, that is being manufac-



JARVIS ELECTRIC BENCH BAND SAWING MACHINE

tured by Benjamin E. Jarvis, Inc., Newark, N. J. The machine is intended for bench mounting. It is of a portable type that can be installed by attaching to any lamp socket, thus eliminating the necessity of countershafts and belting.

The saw bands are of a flexible, Swedish steel of a nature to resist crystallization. The wheels are 12 in. in diameter, 1-in. face, made of steel and mounted on ball bearings. The upper and lower guides are of the roller type and the rolls revolve on hardened centers. The capacity of the machine is for 2-in. wood, either hard or soft. Saw bands can be supplied for cutting thin brass and soft metals.

Current for driving the ¼-hp. motor may be supplied from a lighting circuit. The motor is controlled by means of a pushbutton switch located on the frame of the machine. The table is 13¼ x 15 in. in size and may be tilted to any angle. The machine is 28 in. high and weighs 120 pounds.

Selling Machine Tools

BY ALBERT CLEGG

What are the most essential qualities for the successful selling of machine tools? Is a knowledge of men more desirable than a knowledge of things? In other words, is the jolly good fellow with the pleasing and agreeable personality but with very little technical knowledge likely to make a more successful salesman than the chap who knows the subject from A to Z, but who has not had either the time or the inclination to develop the social side of his being?

We all know that the man who combines a thorough knowledge of his goods with a sound study of human nature and psychology is the man most likely to get there. He is quite ready to agree, when out to sell us something, that our Ford is equal to a Rolls-Royce, that our local football team is almost sure to win the cup, and so on, until we begin to believe that after all our judgment must be sound.

From the salesman's point of view, the study of human nature is all too often a study as to how to sell something to a man who doesn't want it, and who, when he gets it, frequently does not and cannot make the best use of it. Someone has said that the best salesman is a combination of satisfactory product and satisfied customer.

From this point of view the purely psychologist type of salesman is more likely to come a nasty cropper than the purely technical type. The latter, by his very ignorance of human nature, would be protected from the risk of selling a machine or appliance which the purchaser had no use for; in fact, his technical knowledge would prevent him from even trying. On the other hand, his failure to be agreeable might prevent him from convincing a prospective client that he was losing money by not purchasing a certain machine.

The technician is more likely to err by sins of omission, while the psychologist will usually suffer from the results of sins of commission. One will sell more and give less satisfaction per sale and the other will sell less and give more satisfaction per sale. The former might eventually build up a business or connection while the latter would run a grave risk of losing an already established connection. Both men would be learning by bitter experience all the time. The final result would resolve itself into a question as to which man could learn his business the sooner. Is the study of human nature more difficult than the study of machine tool construction, design and operation?

What, then, are the basic principles of salesmanship as particularly applied to machine tools? In the first place it is to establish some definite, sentient connection between the prospective user and the manufacturer with a view to effecting a deal that will be to the mutual benefit of the two parties. Note the word *mutual*; the day is gone by when one confers a favor by purchasing from another. Second, salesmanship should assist the manufacturer in keeping abreast, or ahead, of the times, by indicating the lines successful competitors are following. Third, salesmanship should concern itself with striving to achieve the very widest publicity for the goods.

The day is past when machine tools can be sold by making wild and extravagant statements as to what they can do. An incident which occurred some years ago will serve to illustrate the dangers of such a course. A representative of one of the biggest merchants in the country called on one of his customers to discuss an inquiry for a cutter grinder. The merchant handled one of the leading American makes of cutter grinder, a machine that was almost, but not quite, universal in its capacity. The customer wanted the machine for general cutter grinding work but particularly for a certain special job that was rather outside the usual scope of such a machine. When the representative called he was asked if the machine offered by his firm would be suitable for the special work. In reply he gave a long dissertation as to the capabilities of the machine on every class of cutter grinding and wound up by suggesting that the machine would play the Halleluiah chorus if set up properly. On the strength of his assertions and assurance, the order was placed, the total value being something under £100. Now for the sequel. While the machine was a good one in every way and quite satisfactory on all the ordinary classes of cutter grinding, it was an absolute failure on the job for which it had been particularly bought, and no amount of argument could convince the customer that it was at all suitable. The machine was finally taken back and the representative, by bitter experience, was taught never to make extravagant claims for his machine. For years afterward neither the representative nor his firm sold a penny's worth to the disappointed customer, the loss involved amounting to thousands a year.

To return to our original query, is a knowledge of men more desirable than a knowledge of things? Would we as business men be more likely to give an order to a nice, agreeable sort of chap who knew very little about the subject, than to a directly opposite type of man who knew the whole business thoroughly and could discuss all the pros and cons relating thereto? Of course we all like to meet the smart, incisive fellow, whose personality is such a refreshing tonic in the ordinary, everyday routine of business, but nevertheless very few of us would be prepared to admit (even to ourselves) that our decisions had in any way been influenced by the man's personality alone. In selling machine tools the object is to prove that the tools offered will pay a good return and be entirely satisfactory in the prospective client's works, and the only man qualified to judge that is the one who is thoroughly grounded in the operation of the machine. His personality merely enables him to present his argument in the most agreeable manner, and if he is lacking in a knowledge of the subject his arguments will carry very little weight.

News Section

Air-Cooled Motor Meeting of S.A.E.

The Metropolitan Section of the S. A. E. held its December meeting at the Automobile Club of America on the 14th. The paper was on Air-Cooled Motors by Charles Grimes, research engineer of the H. H. Franklin Co., in which he gave the results of their twenty two years of experience with air cooling. An interesting feature of the paper, and one which shows the broad policy of the Franklin Company, was the pains taken to point out the details to avoid in building a successful motor. The results of their years of experience were laid bare for the benefit of any builder who may be working toward air cooling, and there are many. This is in such marked contrast to the older and, we believe short sighted policy more prevalent in other lines, that it stands out as a shining example of co-operation.

The paper was very complete and showed great care in the development of both the mechanical and the combustion features of the new motor. The small amount of power consumed in cooling was rather astonishing to many and the care with which the details have been worked out is of unusual interest. There was some discussion and numerous questions, all of which were answered very satisfactorily.

Power Exposition Very Successful

The National Exposition of Power and Mechanical Engineering, following as it did the forty-third annual meeting of the American Society of Mechanical Engineers, attracted a large number of engineers from all parts of the country. It was held in the Grand Central Palace, New York, N. Y., from December 7 to 13.

Although there were some exhibits by machine tool and engine builders, the majority of the displays were devoted to equipment for boiler room and power plant use. Firebrick, condenser, stoker, tank, boiler tube and such manufacturers had large exhibits, of a heavy nature in many cases. Valves, meters and a variety of measuring and recording instruments were shown in considerable numbers. The scope of the exposition is attested by the fact that there were about 150 exhibitors. Full size units and working models served to show the practicability of the products exhibited, and added life and interest to the exposition.

A.E.S.C. to Study Steel Numbering Problem

After extended discussion of the problem involved in the numbering of steels, the conference called by the American Engineering Standards Committee, at the request of the Bureau of Standards, decided the matter could be handled better by a sectional committee of the American Engineering Standards Committee. For that reason no plan or program was adopted so that the sectional committee could consider the matter without limitations as to whether the classification be based on chemical analysis, heat treatment or physical tests.

Machinery Exports Show Slight Decrease

Exports of metal-working machinery during October were slightly less than in September although considerably above the value of the exports in October, 1921. October exports were valued at $902,188, as compared with $1,093,381 in September of this year and $1,032,483 in August. The detailed figures, of the Bureau of Foreign and Domestic Commerce, are as follows:

EXPORTS METAL-WORKING MACHINERY

	September 1922	October 1922
Lathes	$54,874	$57,161
Boring and drilling machines	40,628	34,262
Planers,sharpeners and slotters	15,758	38,256
Bending and power presses	11,085	7,179
Gear cutters	14,667	983
Milling Machines	29,662	69,389
Sawing machines	5,041	1,800
Thread cutting and screw machines	22,924	7,464
Punching and shearing machines	7,171	14,977
Power hammers	20,886	10,386
Rolling machines	3,897	786
Wire-drawing machines	81	935
Polishing and burnishing machines	1,265	1,248
Sharpening and grinding machines	56,468	78,044
Chucks, centering; lathe, drill and other	18,676	19,102
Reamers, cutters, drills and other parts for machine tools	114,475	121,944
Pneumatic portable tools	35,389	26,550
Foundry and moulding machinery	44,436	41,314
Other metal-working machinery and parts of	596,508	370,408
Total metal-working machinery	$1,093,381	$902,188

Navy Funds Increased

The Navy appropriation bill reported to the House last week carried appropriations totaling approximately $53,000,000 for continuing construction work on the ships permitted to be completed under the five-power treatry.

This is an increase of $12,000,000 in round numbers over the estimates submitted in the budget, which provided for $29,000,000 in cash and $12,000,000 in indirect appropriations. The increase made by the Appropriations Committee mainly is in the indirect allowances.

Foreign Trade Convention

The Tenth National Foreign Trade Convention of the National Foreign Trade Council will be held in New Orleans on April 25, 26, 27, 1923, according to announcement made last week by O. K. Davis, secretary of the council, India House, New York City.

Domestic Business Shows Further Improvement

Further improvement in the general business situation is shown by November figures so far received by the Department of Commerce. Marked increases have again occurred in the production of pig iron and steel making the output of these industries much the largest for any month in two years. Unfilled orders of the Steel Corporation declined slightly, but this may be due in part to better transportation, which has made it possible to catch up on deliveries. Building contracts in November totaled $248,000,000, or only $5,000.000 less than in October and 30 per cent above November, 1921. Further increases in employment have taken place. The U. S. Employment Service reports that expansion in employment throughout the country has been the greatest since January.

Provides for Increase in Naval Aircraft

A bill, authorizing the Secretary of the Navy, during the fiscal year 1924, to procure, purchase, manufacture, or construct additional aircraft as may be required for the Naval Establishment, including the necessary spare parts and equipment therefor, at a total cost not exceeding $5,798,950, has just been introduced in the House and referred to the Committee on Naval Affairs.

Willard Defends Esch-Cummins Law

To keep the Esch-Cummins Transportation law intact would be the best policy for the Government to pursue with respect to the railroads, according to Daniel Willard, President of the Baltimore & Ohio Railroad, who spoke last week at a luncheon of the Advertising Club, 47 East Twenty-fifth Street.

Although the roads are not yet earning what Mr. Willard considers a fair return on the value of their property, he is confident that a gradual reduction of freight rates may be looked for, providing the Federal rail law in its present form gets a fair and sympathetic trial.

British Industries Fair

The Board of Trade of Great Britain issued during the past week a booklet on the forthcoming British Industries Fair which is to take place concurrently in London and Birmingham from February 19 to March 2, 1923.

The Fair, it is announced, is not an exhibition but essentially a trade fair to which only buyers will be admitted, Americans desiring to attend the Fair, while visiting England, may obtain tickets of admission on application to the British Consulate General, 37 West Van Buren St., Chicago, Ill.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Director, *Commerce and Finance*, New York

(*Copyright, Theodore H. Price Publishing Corporation, 16 Exchange Place, New York*)

THE advance in sterling exchange and the growing shortage of labor are the two most important developments of the week. Bills on London sold at 4.69 last Wednesday and although the market reacted somewhat and stands at 4.65 as this is written it is plain that the masterful financiers of the British Empire are determined to provide the merchants of the realm with a medium of exchange that is as good as the best.

Although it is variously explained, the immediate cause of the advance is not apparent, but it is fundamentally due to the exhibition of financial courage that the English government has given in handling its debt to our government as well as its persistence in attempting to untangle the reparation snarl in which France and Germany are involved.

Mr. Morgan's call upon Secretary Hughes, the ensuing talk of a loan of 1½ billion dollars to Germany, and a statement from the White House indicating that the President would be glad to find a way to aid Europe in settling her economic problems, have also helped the market for foreign exchange. Francs have advanced sharply and even German marks are up to 145 despite the latest statement of the Reichsbank which shows a total of over 753 billion paper marks outstanding as of Nov. 20.

The effect of the advance in exchange has been to lift commodities like wheat and cotton whose value is largely determined by the price obtained for our exportable surplus, but as sterling is now within 4 or 5 per cent of par there is not much room for a further rise and it is quite possible that the Bank of England will soon attempt to strengthen its position by taking gold from us in quantity, even at a small loss.

Should any such movement develop it is almost certain our commodity markets would be chilled, for the analysis published weekly by the Federal Reserve Board shows that the total of the loans, discounts and security holdings of the 784 more important member banks on November 29 was 416 millions greater than on May 25, 1921, when liquidation was being insisted upon as essential. Since that date the gold held by the Federal Reserve Banks (which gained nearly $15,000,000 last week) has increased by over 669 millions, while the Federal Reserves notes in circulation have decreased some 483 millions. The result is that the reserve ratio has risen from 56.8 per cent to 75.1 per cent, but all this would be speedily changed if we commenced to export gold in important amounts.

Our dependence upon a continued abundance of credit for the moderate degree of business activity and prosperity now reported, and in some cases exaggerated, is also emphasized by the labor shortage.

The Department of Labor says that the shortage is acute and this statement is confirmed by employers all over the country. The scarcity is attributed to the restrictions upon immigration. One result of it has been an abnormal exodus from the farms to the cities. The negroes are leaving the South in such numbers that organized efforts to check the hegira are being made in some states, but the railroad passenger agents report that the movement continues nevertheless.

Wages in many industries are already advancing as an inevitable consequence of the competition for labor and the sequence is certain to be a decreased production at an increased cost. This may for a time create an illusion of good times but it will limit consumption, tie up credit and must ultimately restrict activity. The existing railway congestion adds to the difficulties of a difficult situation.

In a recent address President Markham of the Illinois Central Railroad pointed out that in the five years ending with June 30, 1907, the number of freight cars in service increased more than 480,000. In the next five years it increased less than 230,000; in the next four and a half years it increased only 114,000, and in the five years ended with 1921 the number of freight cars in service actually declined more than 13,000.

During the same period the number of locomotives in service varied as follows:

5 years ending June 30, 1907	increased	18,160
5 years ending June 30, 1912	increased	8,447
4½ years ending Dec. 31, 1916	increased	4,558
5 years ending Dec. 31, 1921	decreased	664

These figures explain the present inability of the railroads to handle the traffic that is the economic life blood of the nation. They make it clear that a business boom is impossible because an abnormal increase in distributive trade would be almost certain to result in strangulation and until our railway facilities are increased the check rein of inadequate transportation will probably continue to hold us back.

A year ago when trade was subnormal and well below the capacity of our facilities for production and distribution it was safe to predict an improvement, but the shortage of both labor and transportation seems to make any further expansion presently impossible and this view of the case suggests caution in accepting the many highly optimistic predictions that are now being made.

A mild prosperity is indicated, but no wild outburst of speculation and advancing prices appears to be possible. The Christmas trade is good. The postal receipts swelled by the increased use of the parcels post show a gain of about 20 per cent. The steel mills are fairly busy and copper is at last a little above 14 cents. Sugar is slightly easier as the weight of the new and abundant Cuban crop commences to be felt, and cotton and wheat are somewhat higher because of the advance in foreign exchange as already explained.

The stock market is steadier. The fear of political radicalism appears to be at least temporarily allayed. The year-end selling to reduce income taxes is nearly finished and the reinvestment demand has absorbed several large issues of new bonds.

The purchase of the International & Great Northern by the St. Louis & San Francisco Railway has attracted not a little attention as foreshadowing other transactions of the same character that are inevitable if the consolidations provided for in the Esch-Cummins bill are to become realities. Inasmuch as it is only through such consolidations or government ownership that it will be possible to rehabilitate our transportation service and as either alternative is almost certain to increase the value of railway securities I continue to believe that the greatest bargains of the investment market are to be found among them.

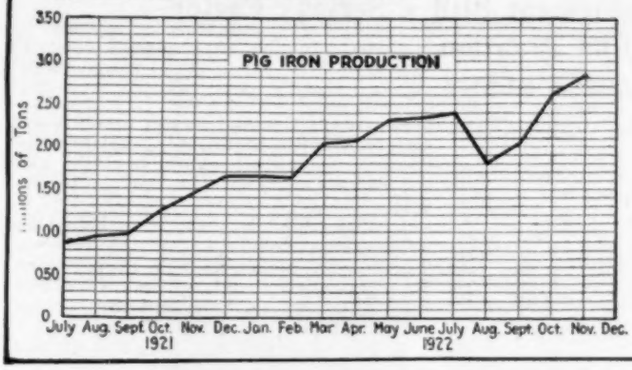
Southern Industries See Prosperity Ahead

A thorough investigation of general conditions prevalent in the metal trades industries over the South, conducted the fore part of this month by William E. Dunn, Jr., secretary of the Southern Metal Trades Association, shows the industry to be in better shape than it has been at any time within the past three years, with every promise that 1923 will prove a prosperous year. Most manufacturers seem to be expecting an inflation period similar to that of 1918 and 1919, but look for it to be on a more stable basis and not followed by so long a period of depression, if any at all.

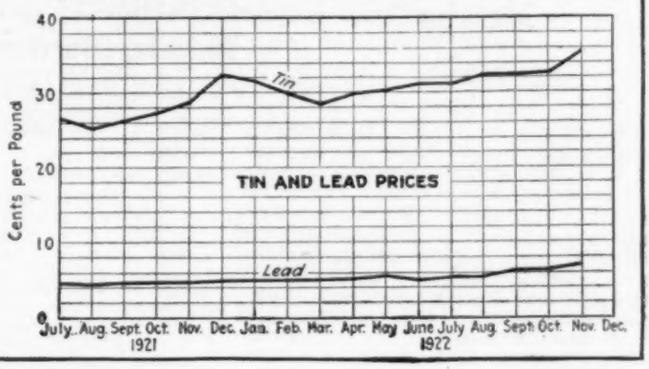
More furnaces, foundries and machine shops are operating in the South now than at any time in several months, and a majority of them are well sold ahead into 1923. The pig iron melt in the whole district, principally in Alabama, is at the highest mark since the flush times during the War. The usual Christmas holiday will, for the most part, be confined to a day or two this year because of the rush of business.

The association advises pig iron quotations for the first quarter of 1923 as somewhat weak, the price on some sales being as low as $23 for No. 2 foundry, with heavier tonnages selling in some cases for as low as $22.50. The prevailing price, however, appears to be around $25 with inquiries very numerous from substantial buyers.

Monthly pig iron production of all coke and anthracite furnaces in millions of tons, based on returns compiled by the American Iron and Steel Institute.



Monthly average price of tin and lead in the New York market, based on returns furnished by Engineering and Mining Journal-Press.



PIG iron production registered another advance in November over the month previous, although the increase was not so marked as in the case of the October output as compared with that of September. Coke and anthracite pig iron tonnage during the month totaled 2,849,703 tons or an average of 94,990 tons per day as against the October total of 2,637,844 or 85,092 tons per day. November, 1920, output totaled 2,934,908 tons or 97,830 per day. The number of blast furnaces in operation increased during the month 242 being in blast on Dec. 1 as against 218 on Nov. 1.

Tin and lead prices were stronger and higher during the month. The average November price for the former was 35.911 cents as against 33.935 in October, while lead reached 7.047 cents, an increase of over a half cent during the thirty-day period. While the demand for both metals for home and foreign consumption has not been of an active nature, a better tone has been in evidence with excellent prospects for a strong market during the first quarter of the coming year.

Automobile share markets declined slightly during the month, ten representative issues showing an average price of $44.20 per share as against the October average of $46.52. No special significance is attached to the decline, the entire New York market showing a softening of prices with but little interest and that chiefly of a professional character in evidence. Automobile production continues heavy with an excellent demand for closed cars and a shortage of bodies.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

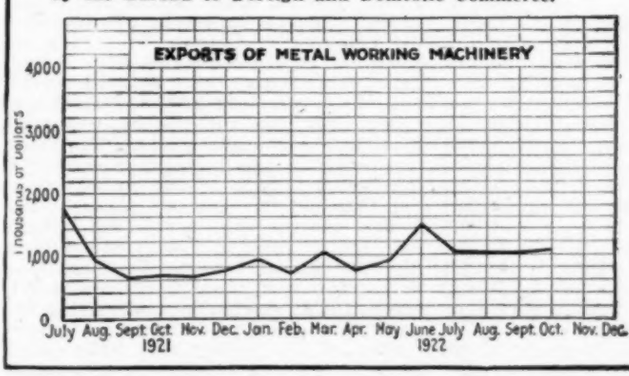
	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb.....	$0.0295	$0.0295	$0.0273
Cold finished shafting.....	per lb.....	0.0378	0.0378	0.0373
Brass rods.....	per lb.....	0.171	0.1700	0.15
Solder (½ and ½)	per lb.....	0.24	0.23	0.20
Cotton waste..	per lb.....	0.11	0.11	0.122
Washers, cast iron (½ in.)...	per 100 lb.	4.33	4.33	4.33
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100.....	3.11	3.11	.....
Lard cutting oil	per gal.....	0.59	0.575	.....
Machine oil....	per gal.....	0.36	0.36	.....
Belting, leather, medium.....	off list.....	30–10% @50%	40–5% @50%	
Machine bolts up to 1 x 30 in.	off list.....	55% @60%	50%@ 65–10%	50%@ 60–10%

Metal working machinery exports held up well during October, considering the European situation, although there was a drop in value as compared with September totals. The value of machinery exports during the month totaled $902,188 against that of the previous month of $1,093,891 and the August total of $1,032,483. As compared with the month of October, 1921, there is shown an increase of over $200,000, the total in that month being $680,931.

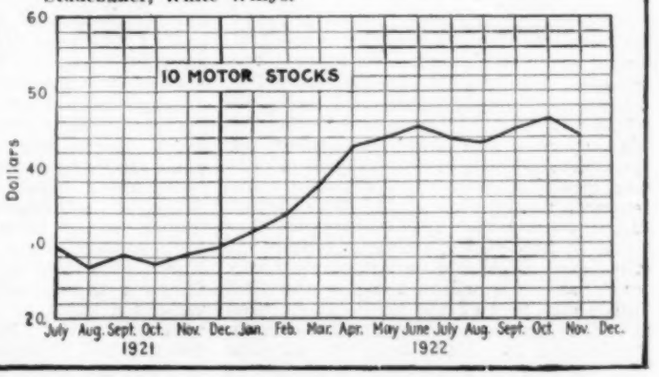
American foreign trade for October shows exports of merchandise totaling $372 millions, a total greater than in any other month since March(1921, and 19 per cent higher than September exports. Import totals for the month have been delayed due to changes in classifications and rates under the new tariff. A review of foreign trade changes during the fiscal year ending June 30, 1922, by the Department of Commerce, recently made public, shows a decline in the value of imports amounting to 28.6 per cent and a decline in the value of exports amounting to 42.1 per cent as compared with 1921.

Financial conditions as reflected in the statement of the Federal Reserve System, at the close of business Dec. 13, 1922, shows gains of $15,400,000 in gold reserve as against a decrease of $3,500,000 in other cash reserves.

Total value of all metal working machinery exported monthly from the United States, based on returns compiled by the Bureau of Foreign and Domestic Commerce.



Average price of ten automotive stocks: Chandler, General Motors, Hupp. Int. Motors, Pierce, Stewart, Stromberg, Studebaker, White Willys.



Business Conditions in Germany

Machine Tool Exports Decline—Unemployment Still a Serious Factor—Industry Burdened by Taxation

BY OUR BERLIN CORRESPONDENT

RECENT political developments, chiefly the problem of the stabilization of the mark, have a decided influence upon the course of events. The possibility that the mark will be stabilized in the neighborhood of 3,000 marks to the dollar, has met with considerable skepticism in the business world which has been disappointed too often to put much faith in such announcements.

As a matter of the simplest precaution, buyers are awaiting further developments. The same applies to export sales, which have to be contracted in foreign money. It is clear that under the present uncertain conditions, all purchases not for immediate demand are in abeyance. The business world is receiving an inkling of what will happen, when the stabilization problem is really taken up seriously.

The conviction, that an improvement of conditions cannot be brought about by financial manipulation alone, is spreading and taking deeper root. With the reparation problem in the background for the time being, the public interest is absorbed almost completely by the two great factors, viz., economy and increase of production. Behind these problems is looming up largely and gloomily the huge conflict between the industry and labor, employers and employees.

Machinery Exports Decline

The actual employment of the machine building industry has not receded perceptibly. Reports of shortening of working time are becoming more frequent, but are caused rather by shortage of material and fuel, than by actual lack of orders in hand. The number of new contracts concluded are, however, becoming more and more unsatisfactory. The tendency to retract on orders already booked is also becoming more marked with buyers, and in a number of cases also with sellers. Generally speaking it may be said, that the standard of employment is gradually sinking, but that a fair level can be maintained during the next two or three months. In the machine building industry the ratio of unemployment from August to September decreased slightly from 3 per 1,000 to 2 per 1,000. This is, however, entirely an exception. In all other trades unemployment has increased.

The decline of foreign business found expression in the September returns of exports. Machinery exported has dropped from 42,800 tons in August to 31,000 tons in September. Nearly all classes of machinery are affected by this drop. Machine tool exports for instance, of which, in August, 10,127 single units weighing 3,881 tons were exported, dropped to 7,133 units or 2,412 tons, which is considerably less than in any of the previous months of the year. The total export of machiney and that of machine tools in the first three quarters of the year can be seen by the figures in the accompanying table. As an item of interest, the price per ton realized is added in paper marks and in corresponding gold marks computed at the prevailing rate of exchange.

TOTAL EXPORTS OF MACHINERY FROM GERMANY DURING 1922

1922	Tons	Value Million Marks	Price per Ton Paper Marks	Price per Ton Gold Marks
1. quarter	112,199	3,644	32,500	600
2. quarter	116,715	4,898	42,000	590
3. quarter	110,243	10,571	95,800	390

MACHINE TOOL EXPORTS

1. quarter	16,593	.....	25,400	470
2. quarter	11,900	.....	47,800	670
3. quarter	9,276	.....	108,000	440

From these figures it can be seen, that the exports in the third quarter fall short of both previous quarters. This is solely due to the bad returns of September, the returns of July and August being in keeping with the previous months. The September exports of machine tools represent a value of 1,440 million paper marks. The price per ton is 172,000 paper marks or 490 gold marks. Nearly all foreign markets have contributed to this decline. It is interesting to note, that machine tool imports in September have kept at the level of August as regards weight, while the number of single tools has increased.

In view of the still continuing business depression in most of the German markets considerable disappointment is also felt that, after a promising start, the Russian market is again closing up. This is explained by the Russian Government to be due to the fact, that the Russian works are now in such a state, that they can largely satisfy the demand. From various reports this appears to be gross exaggeration and is only barely veiling the real reasons, which no doubt are to be found in the realm of finance. This is a hard blow, especially to the locomotive industry, which has been figuring on large business for Russia, especially as the German railroads have considerably reduced their annual requirements. An order for 60 locomotives for Rumania, which it is reported has recently been given, is of course only a small compensation.

Fluctuating Tool Prices

It is illustrative of the rapid movement of prices, that the price directions issued by the Machine Tool Builders' Association are now issued in intervals of 10 days. While the increase of the price over the previous month was in September 45 per cent, it was in October 87 per cent and for the first 10 days of November 93 per cent. At the time of writing prices of machine tools average from 1,000 to 1,500 marks per kg. compared with approximately 1 mark in pre-war times. This is the price for standard tools. Specialities command a considerably higher price. A case your correspondent heard quoted today seems to be about the highest that prices have climbed up to. For a gear cutting machine of the old Gleason type (templet) of 3,000 kg. weight a price of 10 million marks or somewhat over 3,000 marks per kg. is being asked. This is considerably above pre-war standard, even in goldmarks.

Greatly divergent and frequently erroneous opinions prevail in foreign countries with regard to taxation, the German industrial establishments are subjected to. This taxation is threefold:

1. The trade tax, which is levied in progressive proportion of the income. The lowest percentage is 1½ per cent for gross revenues from 15-20,000 marks, rising to 27 per cent for a gross revenue above 3 million marks,
2. The company tax, which is 10 per cent of the net revenues,
3. The capital transfer tax, raised on all capital transactions, like new floatations, loans issued, bonds and the like. This tax is 7½ per cent.

Heavy Taxation Burden

In the case of a company, for instance, which has earned a revenue of 1 million marks per year, after paying all expenses, such as salaries, wages and sundries, and which has raised a loan of 1 million marks, the taxation would be as follows:

First, 20 per cent on the revenue plus such expenditure, which remains subject to the taxation under the law, like rents, interest on loans and mortgages, cost of repair of premises and 40 per cent of new equipment. This taxible expenditure frequently equals and even exceeds the revenue.

Second, the company tax of 10 per cent payable on the amount of revenue remaining after paying the trade tax.

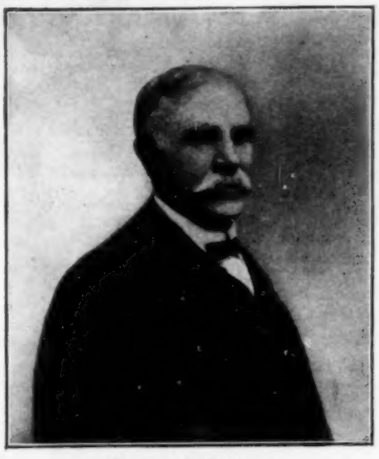
Third, the capital transfer tax of 7½ per cent on the loan of 1 million marks, allowed to be put under deductible expenditure.

In the average the taxes amount to from 35 to 60 per cent of the revenue. The turn-over tax, which is raised on the transfer of any property from one hand to the other by sale, is not included, as it is an indirect tax, which is burdened upon the buyer.

As has already been mentioned in these columns, the credit situation of the industry in this country has somewhat eased in consequence of the huge sums of German money in foreign hands flowing back into the country in the shape of investments in industrial securities. A further source is domestic capital, which, the buying craze having ceased, is again taking notice of the low price of industrial stock. Helped by such conditions, many manufacturing companies again come on the money market with capital and bond issues. The fresh capital obsorbed by the industry in October amounted to 5,374 million marks, which is a record figure in paper marks. In gold marks it is, however, only 5,300,000 marks, a ridiculously low sum in comparison to previous months and years. The total fresh capital the industry received in the first 9 months of the current year by increase of capital stock, bond issues, and the like, is only 309 million gold marks compared with 814 million gold marks last year. This explains perhaps better than words could do, the financial straits, into which the industry has dropped through the depreciation of the money with little relief in sight through adjustment of reparations question.

George Richards Dies in England

GEORGE RICHARDS, formerly of George Richards & Co., Ltd., Broadheath, near Manchester, England, and later of the Richards Thread Milling Machine Co., London, England, died on Nov. 17. Mr. Richards was a well known designer of machine tools of



GEORGE RICHARDS

advanced type and though he lived in England for many years, never relinquished his American citizenship. He was impoverished by the late war and his financial condition became so low that, pending an appeal to his many friends for assistance, he was forced to become an inmate of the London County House, where he died.

Trade Trip to Cuba

A group of manufacturers from Atlanta and Chattanooga, many of them connected with the metal trades industries, will make a trade trip to Cuba some time during February under the auspices of the Atlanta and Chattanooga Chambers of Commerce, and the Southern Railway System. The purpose of the tour will be to further expand trade relations between Southern manufacturers and the island of Cuba. Within the past few years Atlanta manufacturers and jobbers have built up from practically nothing an export trade with Cuba now in excess of $1,000,000 per year, and there is still room for great improvement. A large part of this export business is in machinery and machinery supplies, machine tools, railroad equipment, and other metal products.

New Worthington Heads

E. T. Fishwick and William Goodman have been appointed vice presidents of the Worthington Pump and Machinery Corporation, 115 Broadway, to fill vacancies made by the resignation of Frank H. Jones and James E. Sague.

Mr. Fishwick was formerly general sales manager and now takes the title of vice president in charge of sales. Mr. Goodman, previously in the executive engineering department, is now vice president in charge of engineering and manufacturing.

Although both Messrs. Jones and Sague have resigned as titled officers they will both remain with the corporation in an advisory capacity.

Business Items

The Goss & DeLeeuw Machine Co., of New Britain, Conn., has incorporated under the laws of Connecticut, with a capital stock of $100,000 to manufacture machinery, tools, etc., operating a plant at New Britain. The incorporators of the company are: Stanley T. Goss, of New Britain, Conn.; John S. Black, New Britain; and Adolph L. DeLeeuw, of Plainfield, N. J.

The Nashville Bridge Co., of Nashville, Tenn., according to officials of the company, is planning the immediate establishment at Bessemer, Ala., of a branch plant to include general shops and units for the production of heavier structural steel. The principal bridge department of the company will remain at Nashville.

The Anderson Tractor Co., recently noted incorporated at Anderson, S. C., proposes the establishment there of a large plant for the manufacture of tractors and sprays for use in cotton fields of the South, according to W. S. Anderson, president of the company. The capital stock of the concern is $200,000.

The Atlantic Coast Line Railroad Co., advises that it is planning the early construction of machine and engine shops and a roundhouse at Port Tampa, Fla., to entail a total investment of approximately $150,000. The work is in charge of the engineering office of the railroad at Wilmington, N. C.

The Crane Co., of Chicago, has established an additional southern branch at 738 West Bay Street, Jacksonville, Fla., this branch to serve the company's trade in South Georgia and all of Florida. The Atlanta branch serves the rest of Georgia and nearby states. P. Z. Huddleston is named manager of the Jacksonville branch.

The National Cast Iron Pipe Co., of Tarrant City and Birmingham, Ala., at the annual meeting of the stockholders and officers to be held the latter part of December, will consider a plan to increase the capital stock from $500,000 to $1,000,000 and favorable action is expected. A larger production during 1923 through the establishment of additional units, and a further expansion of its export facilities is the plan of the company.

Lorne Tractors, Ltd., which has been incorporated for $300,000 at Tillsonburg, Ont., and is erecting a new factory there to build a gasoline equipment, including fire engines, has elected the following officers: L. Carmichael, president; J. M. Clark, vice-president; and L. C. Vangeel, secretary-treasurer.

The Fleming Machine Co., formerly located at 172 Chestnut St., Springfield, Mass., has removed its office to 41 Mercantile St., Worcester, Mass.

The North & Judd Manufacturing Co. in order to keep up with the demand for "Anchor Brand" hardware products has reopened its New Haven plant which was purchased in 1919. The foundry department is now in operation with a large number of moulders.

The Terry Steam Turbine Co., manufacturer of turbines, blowers, etc., of Hartford, Conn., with branches in Chicago, New York, Philadelphia and Pittsburgh, has recently increased its capital stock from $700,000 to $800,000. The number of shares was also increased from 7,000 common to 4,000 of common and 4,000 of preferred stock.

The Pequennock Foundry, Inc., 5th St. Extension, Bridgeport, Conn., has recently increased its capital stock from $10,000 to $50,000.

The Hartford Tool Works, Inc., maker of tools, etc., Hartford, Conn., has filed a preliminary certificate of dissolution with the Secretary of the State of Connecticut. All claims against the company should be mailed to Richard H. Deming, 36 Pearl Street, Hartford, Conn.

The Precision Instrument Co., Inc., has acquired control of the Precision Instrument Co. of Newark, N. J., well known for its line of "3 in 1" draft gauges, pressure recording instruments, CO_2 recorders, specific gravity recorders, laboratory gas meters, gas calorimeters, and other lines. The present executive officers, who have been so successful, will retain their connection with the company. It is expected to enlarge the business considerably, with new capital, adding other specialties, besides staple lines of gauges, valves and fittings. The company's New York office will be in the Engineering Building, 114 Liberty St. The factory will later be moved to New York.

The Kemp Machinery Co., 215 N. Calvert St., Baltimore, Md., has been appointed exclusive representative by the Diamant Tool and Manufacturing Co., 91 Runyon St., Newark, N. J., in connection with the sale of Diamant standard punch and die sets, in the territory covered by the states of Maryland, Virginia, District of Columbia and West Virginia consisting of Jefferson, Berkley, Morgan, Hampshire, Mineral Hardy, Grant, Pendleton, Randolph, Pocahontas, Green Brier, Monroe and Mercer Counties.

The R. S. Leafless Spring Co., of Fresno, Cal., has been organized with Frank Waterfield, Mason Building, in that city, at its head and will engage in the manufacture of a new spring for motor vehicles to eliminate the necessity of shock absorbers. The new company is capitalized at $150,000.

The National Iron Works, San Diego, Cal., has filed articles of incorporation, to establish and operate foundries, with capitalization of $100,000. The incorporators are James R. Russell, C. H. Martin and Leo G. Moore.

The Missouri Boiler Works Co. of Kansas, has been incorporated to do business in Missouri with headquarters in Kansas City. The company will manufacture and sell boilers, engines, smoke stacks and all other machinery used in boiler shops and factories. The incorporators are I. H. Darby, E. D. Proudfit and F. I. Darby.

The North Missouri Power Co. of Excelsior Springs, Mo., has filed articles of incorporation with Secretary of State at Jefferson City, showing a capitalization of $1,700,000. The company will carry on an electric power, light, gas, waterworks, hot water and steam heating business. The incorporators are S. W. Henderson, H. L. Moore, C. W. Fish, W. E. Crawford and F. A. Boys.

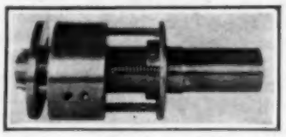
The Spencer Turbine Co., manufacturer of turbines, etc., Hartford, Conn., has recently increased its authorized capital stock from $300,000 to $600,000.

The North & Judd Manufacturing Co., manufacturer of hardware and

Condensed-Clipping Index of Equipment

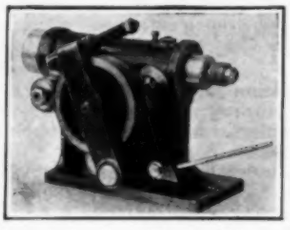
Patented Aug. 20, 1918

Taps, Pipe, Collapsible, Receding-Chaser
Victor Tool Co., Waynesboro, Pa.
"American Machinist," October 26, 1922



The stationary lever-operated type and the rotary type of tap have been re-designed. The short chasers are made to recede as the tap enters the work. In the stationary type two cam blocks work in conjunction to give a positive control to the receding chasers. In the rotary type a ring is used for setting the collars and chasers in position for cutting, which can be accomplished without stopping the machine. Both styles have a means for adjusting the diameter, with a range of $\frac{1}{16}$ in. over or under size. By adjusting the trip collar, any length of thread can be cut. Interrupted thread chasers are used for tapping steel. The tap is furnished in sizes from 1¼ to 12 in. in diameter.

Drilling Machine, Sensitive, Automatic, Horizontal, No. 8
Kingsbury Manufacturing Co., Keene, N. H.
"American Machinist," October 26, 1922

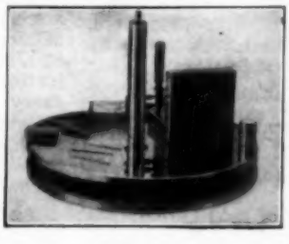


The machine head has a fully automatic feed and control similar to that on the vertical model. The cam gives a stroke of 1 in. to the spindle with a maximum feed of 0.011 in. per revolution. The head can be mounted on the base in multiple and supplied with automatically operated work-holding fixtures for high production on special work. It can be driven by either a countershaft or ½-hp. motor. Capacity, drills from No. 60 to ¾ in. in diameter. Spindle: adjustment, 2 in.; travel, 1 in.; height above the base, 6¾ in. Height, 9½ in. Weight, 50 pounds.

Hoist, Chain, Electrically Operated, "Motorbloc"
Motorbloc Corporation, Summerdale, Philadelphia, Pa.
"American Machinist," October 26, 1922

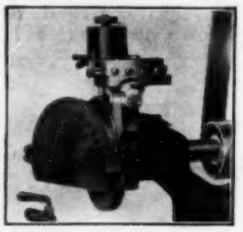
The device can be installed by attachment to lighting or power circuits. It consists of a standardized steel chain hoist, electrified by the application of a heavy-duty motor, reduction gearing and a slip friction clutch, all mounted on a supporting bracket to form a self-contained electrifying unit, to which the pendant controller is attached. The electrifying unit can be applied to standard chain hoists already in service. Where electric current is not available the hand chain can be quickly applied. The mechanism is for use on chain hoists having capacities from ½ to 10 tons. Provision is made for adequate automatic lubrication of the armature shaft and worm. The pendant controller can be easily operated by one hand. Weight of 1-ton size, 148 pounds.

Surface Plates, Steel, Hardened, Lapped
Van Keuren Co., 362 Cambridge St., Boston 34, Mass.
"American Machinist," October 26, 1922



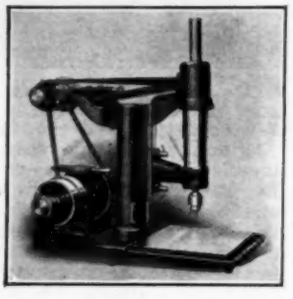
The plates are suitable for general use, as well as in the toolroom. They are free from the hills and valleys arising from hand scraping and have been tested by light waves for planeness, during manufacture. The plates are furnished in 5-, 8- and 10-in. diameters and are made with two handles which screw into the edges of each plate. A wooden box protects the surface when not in use. The plates may be used with a dial gage for the inspection of small parts and for sine bar setups. Gage blocks may be wrung directly on the surface plates.

Wheel-Truing Device, Angular
Wilmarth & Morman Co., Grand Rapids, Mich.
"American Machinist," October 26, 1922



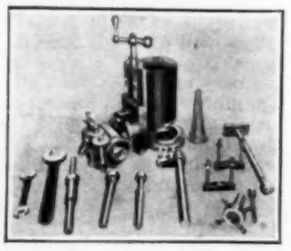
The device is intended for use in shops salvaging and reclaiming worn-out milling machine cutters, reamers and drills, as well as those making a specialty of cast stellite cutters and tools. With the device, the wheel can be easily formed to correspond to the outline to be ground. The diamond is fed to the wheel by means of the knurled knob at the top, while the crank is employed to feed the diamond across the face of the wheel. By means of the graduated dial, the device can be set at the desired angle, the diamond carrying member being tilted to either side for dressing the wheel face at an angle. The wheel can be properly dressed without disturbing the set-up of the work.

Drilling Machine, High-Speed, Bench, No. 0
Sigourney Tool Co., Hartford, Conn.
"American Machinist," October 26, 1922



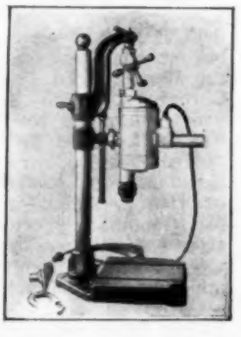
The machine is of the belt-driven type with two countershafts adjustably mounted on the frame. The tension of the belt is adjusted by changing the distance between the countershafts. There is no center hole in the spindle, but the lower end is fitted to the taper socket of a No. 1 Jacobs drill chuck with a capacity for drills from 0 to $\frac{1}{16}$ in. in diameter. Spindle speeds of 2,000, 4,000 and 8,000 r.p.m. are furnished, but by increasing the speed of the first countershaft higher speeds may be obtained. Spindle movement, 1½ in. Table surface, 7½ x 8 in. Vertical adjustment of head, 2½ in. Maximum height, table to chuck, 3½ in. Bench space, 12 x 20 in. Weight, 50 pounds.

Milling Attachment, Multi-Purpose, "Millerette"
Production Machine Tool Co., 629 E. Pearl St., Cincinnati, O.
"American Machinist," October 26, 1922



The device can be set at any angle and is built in three sizes for lathes with from 12- to 24-in. swing. It converts a lathe into a milling machine for cutting spur and bevel gears, for surface milling, angle cutting and spline and keyway cutting. The attachment fits the toolpost slot in the top slide of the compound rest of the lathe. The lathe supplies the power, carries the cutter on an arbor between centers and gives both longitudinal and cross feeds. The down slide of the Millerette can be operated by a handle. The Millerette can be used on a drilling machine to accurately space the holes to be drilled and to hold work requiring indexing; and on planers and shapers as a dividing head. The index plate shows the gears to be used and the number of turns of the index handle required to obtain from 2 to 360 divisions.

Drill, Electric, Portable, with Bench Stand
A. F. Way Co., Hartford, Conn.
"American Machinist," October 26, 1922



With the portable stand the tool can be converted into a bench or floor drilling machine. The drill, which is complete without the stand, may be used as a hand tool. The breast plate and handle are instantly attachable to the drill by the same "union" couplings holding the drill to the stand. The screw feeding mechanism is separate from both drill and stand. Because of the right-angle mounting of the hand-wheel, the feed may be used in very close quarters. The special motor is of universal type either d.c. or a.c. and can be furnished for 110 or 220 volts. Capacity of chuck, ½ in.. Mounted upon stand: maximum distance chuck to base, 14 in.; vertical adjustment, 6 in.; weight, 115 pounds.

Clip, paste on 3 x 5-in. cards and file as desired

tools, New Britain, Conn., announces the re-opening of its New Haven, Conn., plant, and the foundry is now in operation with a large number of workers. The plant was formerly owned by the W. & E. T. Fitch Co., New Haven.

The Brooks Machine Works, 225 West Lewis St., Wichita, Kan., is installing some new machinery. The new equipment, according to J. M. Hackney, president of the company, will make it one of the best equipped shops in that city.

The Frasse Steel Works, Inc., Hartford, Conn., has been appointed the exclusive New England distributor for the Sizer Steel Corporation with plants at Buffalo and Solvay (Syracuse), manufacturer of electric carbon alloy and tool steels, bars, billets and forgings.

The Brown & Zortman Machinery Co. has been appointed exclusive agent in the territory of West Virginia, the western part of Pennsylvania and the southeastern part of Ohio, by the Wilmarth & Morman Co., Grand Rapids, Mich., for its complete line of grinding machines.

The Carpenter Steel Co. of Reading, Pa., has announced officially that reports recently circulated regarding the merger of the company with some other steel concern are entirely erroneous. No such negotiations, it is announced, are pending and the Carpenter company contemplates no change in ownership or management.

Manning, Maxwell & Moore, Inc., has been appointed exclusive agent in the states of New York, New Jersey, Delaware, Maryland and Pennsylvania east of Altoona, by the Wilmarth & Morman Co., Grand Rapids, Mich., for its complete line of grinding machinery.

The St. John Shipbuilding and Dry Dock Co., Ltd., has nearly completed the construction work on its machine shops at St. John, New Brunswick. The shops, which are of modern type, will be opened in the spring in connection with the dry dock now being built at St. John, N. B.

The T. McAvity and Sons, Limited, of St. John, New Brunswick, manufacturer of hydrants, gages, valves, steel and copper pipe, boilers, etc., is gradually moving its machine shops to the new plant of the company near the city limits of St. John. There are three new buildings of steel, concrete and glass.

The Lunenburg Machine Works and Foundry Co., operating a plant at Lunenburg, Nova Scotia, has been operating steadily, and indications are that the company will keep the plant in operation on full time through the winter.

The Canada Car Co. plant at Amherst, Nova Scotia, is expected to start work on a big car order soon after Christmas. The Canadian National Railways' management intends to order several thousands of new freight cars in order to cope with the demand for cars. The machine shops of the car company are being made ready in anticipation of a big order.

The Canadian Pacific Railway machine shops at McAdam, New Brunswick, are working on full time and report is current regarding the possibility of a new machine shop building being erected at McAdam early in the spring to be ready for next fall.

Personals

ARTHUR L. COLLINS, for the past six months associated with the Standard Steel and Bearings, Inc., has entered the tool and alloy steel department of Horace T. Potts & Co., Philadelphia, as sales metallurgist. His work will be with the various mills turning out the Potts' brands of steels and with the users of these steels in advising on applications and heat treatments.

ALFRED B. CARHART has resigned his position as vice-president and sales manager of the Crosby Steam Gage and Valve Co., to become president and general manager of the Precision Instrument Company, Inc., 21 Halsey St., Newark, N. J.

MARK L. SPERRY, JR., assistant to the superintendent of the Scovill Manufacturing Co., Waterbury, Conn., has been appointed Naval Aide on the Staff of Governor-elect Charles A. Templeton, of Connecticut. Mr. Sperry is a lieutenant-commander, resigning from the Navy in 1921.

MITCHELL S. LITTLE, president of the M. S. Littie Manufacturing Co., plumbers' goods manufacturer, Hartford, Conn., and also president of the Sigourney Tool Co., tool maker, Hartford, Conn., has recently been elected a director of the Hartford-Aetna National Bank, of that city.

COLTON D. NOBLE, formerly sales manager of the North & Judd Manufacturing Co., hardware and tool manufacturer, New Britain, Conn., will return to the company shortly. Mr. Noble left the concern back in 1918, to associate himself with the M. S. Brooks Co., maker of brackets, hooks, hardware, etc., of Chester, Conn.

MAJOR EMIL MANWEILER, general manager and secretary of the various plants of the Eastern Malleable Iron Co., with headquarters at Naugatuck, Conn., has been appointed aide-de-camp on the staff of Governor-elect Charles A. Templeton, of Connecticut.

JOHN M. BURRALL, secretary and general manager of the American Ring Co., manufacturer of castings, holders, stampings, etc., of Waterbury, Conn., has been appointed an aide-de-camp on the staff of Governor-elect Charles A. Templeton, of Connecticut.

Obituary

W. B. EVERETS, general traffic manager, Westinghouse Electric and Manufacturing Co., died Dec. 5 at his home 328 Emerson Ave., Pittsburgh, where he had been confined for one week with pneumonia. Mr. Everest was born July 3, 1868, at Newark, N. J.

MISS IRENE PECK SCHOFIELD, for about 15 years secretary of the Universal Boring Machine Co., Hudson, Mass., died at her home in that city Dec. 3. Miss Schofield was a native of Hudson, active in social and political work and was a candidate for local office at the recent election.

JOHN HERGET, since 1904, treasurer of the Century Electric Co., St. Louis, Mo., died at his home in that city, Nov. 14, 1922.

Book Reviews

Production Grinding. By Fred B. Jacobs. Two hundred eighteen 6x9 in. pages, illustrated. Cloth boards. Published by the Penton Publishing Co., Cleveland, Ohio. Price $3.00.

A book describing the grinding operations performed in a number of plants engaged on large-scale production work. A number of the chapters have appeared from time to time as articles in *Abrasive Industry* of which the author is editor. No attempts are made to explain theories of grinding nor to assemble data for the selection of types of machines and grit and grade of wheels for various kinds of work, but perhaps it is just as well that a book on production grinding was confined to a recounting of how individual operations are actually being done. For almost all operations specifications are furnished as to kind of machine, material and wheel; in some cases, further information is given, such as speeds of wheel and work, amount of stock removed, and production per hour. From a literary viewpoint no great praise can be given, a characteristic of too many technical books. Illustrations for the most part are good.

Included in the contents are chapters on grinding parts of the Marmon, Packard, Oakland, Chevrolet and Ford automobiles, tractor parts, chilled iron cams, ball and roller bearings, dental parts, paper mill and chilled iron rolls, milling cutters and dies, and regrinding automobile parts.

The Control of Quality in Manufacturing. By G. S. Radford, Consulting Engineer. Three hundred ninety-one 6x9 in. pages illustrated. Cloth boards. Published by the Ronald Press Co., 20 Vesey St., New York, N. Y. Price $5.00.

An unusual book, carefully planned and well written. It points out, what so many times is overlooked, that quality in manufacturing is essential, not only as such, but as a determining factor in quantity production. Much of the book is devoted to the subject of inspection, and very properly so. Had it not been for the war, the vital importance of thorough inspection in all manufacture would probably not have been realized for many years. Necessity to live up to the letter of specifications compelled many manufacturers to discover methods of maintaining quality, methods that have since been adopted as indispensable. It is an attempt to show the true relation of quality to quantity, sales and cost, that the book was written.

Chapter I consists of an introduction which is a logical plea for quality in all manufacture. The second chapter leads up to the subject of inspection, to which the third to eleventh chapters, inclusive, are devoted. The remaining chapters deal with quality control in practice, measurement and errors, quality defined, working standards, repetition manufacturing, the dimensional control laboratory, gages and gage-checking, thread gaging, the precise control of processes, the control of color, the scientific attitude of mind and its methods, the method of attack to control quality.

Dyke's Automobile and Gasoline Engine Encyclopaedia. By A. L. Dyke. Thirteenth Edition, enlarged and entirely rewritten. 1,238 pages, 7 x 10, illustrated. Published by Goodheart-Wilcox Co., 2009 South Michigan Blvd., Chicago. Price $6.

It is a pleasure to review an old friend such as this book which has gone through twelve successful editions and now appears in its thirteenth. The reviewer found an earlier edition an invaluable aid in his work with aviation cadets during the war and is well acquainted with its merits.

In rearranging the text and illustrations for the current edition, the author has wisely eliminated the chart pages made up of groups of illustrations and inserted the several sketches in the body of the text so that it is unnecessary to hunt around for an illustration when one is referred to.

At the beginning of each chapter the fundamental principles underlying the subject under discussion are outlined and the details are worked in afterward. Not only is the function of every part of an automobile completely covered, but its maintenance and repair as well. The book should be quite as valuable to the garage repairman as to the car owner.

Thirteen principal sections are embodied in the book as follows: I, Assembly of the Automobile; II, Automobile Electric Systems; III, The Storage Battery; IV, Wiring Diagrams; V, Ignition and Carburetion; VI, Tires; VII, Garage and Shop Equip-

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Press, Punch, Combination Foot and Power

A. F. Way Co., Hartford, Conn.

"American Machinist," October 26, 1922

As a foot press the machine is of the pendulum type, actuated by a swinging foot-lever, or pendulum, which is permanently attached to the machine. A positive stop limits the downward movement of the ram. Changing the position of the bolt attaching the pendulum to the upper lever, converts the tool into a strongly driven power press, actuated by an eccentric and the toggle levers at the rear. A 2¼ in. square hole through the bed allows for the passage of blanks through the dies. A 5 x 12-in. surface is available for attaching the dies. Vertical adustment of the ram is secured by placing blocks above and below the rounded end of the actuating lever. A slotted disk at the end of the shaft provides for the attachment of roll or other automatic feeds. Stroke of press, 1 in. Weight, 325 pounds.

Metal, Bearing

Stewart Manufacturing Corporation, 4535 Fullerton Ave., Chicago, Ill.

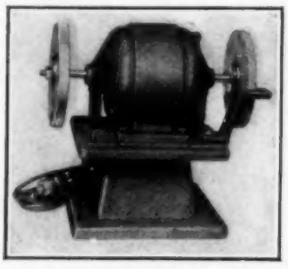
"American Machinist," October 26, 1922

This bearing metal is an inseparable composition of copper and lead which can be remelted and cast any number of times under ordinary foundry conditions without segregation. It is especially adaptable for bearings where lubrication sometimes fails. Above 600 deg. F. the metal sweats lead and lubricates itself, and 1,700 deg. F. is the melting point. The metal is made in four degrees of hardness, to suit all operations and requirements. Grades B, C, D and E vary in Brinell hardness from 25 to 80, the latter being intended for heavy service. Standard bushings of the metal are made in 316 sizes, this range being calculated to meet nearly all ordinary requirements. The metal is furnished in the form of tubes, which are finished all over and made in 13-in. length instead of the 12-in. length.

Grinder and Buffer, Bench, Portable, "Special"

J. G. Blount Co., Everett, Mass.

"American Machinist," November 2, 1922

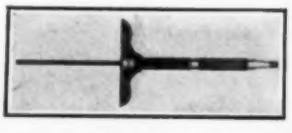


The machine is a plain bearing, motor-driven combination grinder and buffer and is suitable for light work in garages and repair shops. It is driven by a single-phase motor giving ½ hp. at 1,800 r.p.m. and supplied for either single-phase a.c. of 110 or 220 volts and 60 cycles or d.c. of 32, 110 or 220 volts. The ground spindle runs in wick-oiled bronze bearings and carries a 6 x ½-in. grinding wheel and a 7 x ¾-in. sewed buffing wheel. The base of the machine carries a cast iron toolrest and is slotted so that guards can be fitted for the wheels. If it is desired to use the machine as a small power unit, a 2-in. V-belt pulley can be furnished on the spindle between the flange and the motor bearing. Weight, 42 pounds.

Gage, Depth, Spring

L. S. Starrett Co., Athol, Mass.

"American Machinist," November 2, 1922



The spring in the barrel automatically forces the rod downward and the clamp screw locks the rod in position. The gage has a capacity up to 3 in., its principal use being the measuring of depth of drilled holes. The gage has a base 2½ in. long and the rod itself is ½ in. in diameter. The base and the contact point of the rod are not lapped, but are tempered and ground. The contact end of the rod is square instead of convex, for easier manipulation when measuring from a plane surface to a very narrow shoulder.

Chuck, Collet, Quick-Change, Improved, "Wizard"

McCrosky Tool Corporation, Meadville, Pa.

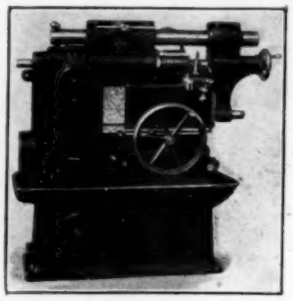
"American Machinist," October 26, 1922

The device is simpler and sturdier than the original model. The chuck consists of two main parts, a driving body having a Morse taper shank to fit the spindle of the drilling machine, and a hardened slotted collar to hold the collet in the driving body. The bayonet locking slots in the collar admit the driving lugs of the collet. The construction permits the operator to insert or release the collet with one hand without slowing or stopping the machine. The tool is inserted by merely pushing the collet up into the revolving chuck, where the automatic latch instantly locks it. The tool is released by pressing the knurled collar of the chuck so as to retard it. The chuck holds the same sizes and styles of collets employed on the former model.

Lathe, Stub, "Sundstrand"

Rockford Tool Co., 2400 Eleventh St., Rockford, Ill.

"American Machinist," November 2, 1922

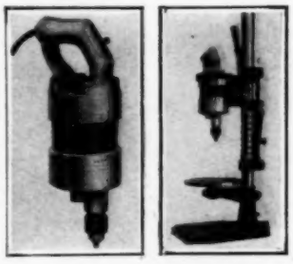


The machine is intended especially for turning automotive pistons. The carriage ways and headstock are one casting. The heavy tailstock is clamped to a large overhanging arm supported on a stud protruding from the bed. The 18-in. carriage has bearing for its full length both on the face on the front side of the bed and on an angular surface on the top. The front toolslide is wide enough for several tools to be clamped on at one setting. The rear tool is mounted on a slide having a cross travel of 4 in. A 5-hp. motor running at 1,800 r.p.m. is fastened on a pivoted frame inside the bed. Capacity between centers, 12 in. Spindle speeds, 40, 50, 65, 85, 110 and 145 r.p.m. Feeds: Six, from 0.020 to 0.090 in. per rev. Weight, 3,000 pounds.

Drills, Electric, Portable, ¼- and ½-Inch

C. L. P. Electric Co., 62 Dey St., New York, N. Y.

"American Machinist," November 2, 1922



Both machines are driven by universal motors furnished for either 110 or 220 volt current. The armature runs on ball bearings and a fan is provided for air-cooling the motor. The table can be removed without disturbing any inside connections of the drill. The drill is equipped with a three-jaw Jacobs chuck, threaded to the end of the spindle. Extension spindles can be supplied. The large handle on the ¼-in. drill at the rear of the motor is equipped with a switch that stays in either the on or off position. A stand can be furnished for precision drilling. The ½-in. drill is equipped with a grip handle and two side handles in one of which a switch is placed. Each machine is furnished with a plug and a 10-ft. cable.

Drilling Machine, Bench, with Plain Bearings, No. 1

Sigourney Tool Co., Hartford, Conn.

"American Machinist," November 2, 1922

This machine is similar in design to the ball-bearing, high-speed drilling machine, but is intended for slower speeds. Except for a ball thrust bearing to take the drilling pressure, the parts run upon plain bronze bearings. A chuck holds drills up to ⅜ in. in diameter, although for larger sizes taper-shank drills are used. The spindle has a taper hole to take a No. 1 Morse taper shank, and a vertical movement of 2½ in. It is balanced by a coil spring concealed in the case of the spindle bracket. A clamp stop is provided to regulate the depth of the hole drilled. The head may be adjusted vertically upon the face of the column through a distance of 6 in. Three changes of speed are available. An overhead countershaft can be furnished. Table, 10½ x 14 in. Weight, 170 pounds.

Clip, paste on 3 x 5-in. cards and file as desired

ment; VIII, Repairing and Overhauling Engine and Car; IX, Oxy-Acetylene Welding; X, Commercial Cars; XI, Tractors; XII, Ford Car, Tractor, etc.; XIII, Data, Specifications, Horsepower, Useful Information.

A dictionary of motor terms is included in this edition and an elaborate index in which each subject treated is indexed in three ways: In its relation to parts; in its relation to the operation of the car; in connection with the make of the car.

Technical Procedure in Exporting and Importing. By Morris Rosenthal. 312 pages with index. Published by the McGraw-Hill Book Co., 370 Seventh Ave., New York City. Price $3.00.

In this handy little volume on foreign trade the author has described in detail the mechanics of exporting merchandise from, and importing merchandise into the United States.

The general arrangement of the book is good. It is divided into five main subdivisions or parts, each of which contains short, easy-to-read chapters. The simplicity of the scheme is commendable in that it enables the reader to follow an incoming or an outgoing shipment through the successive steps taken by an overseas shipment with the shipment itself constantly before his eye.

In Part I, the author devotes the opening chapter to defining, in simple language, the terms continually met with in inland and overseas shipment. The export sales contract is then discussed, following which, the matter of routing shipments, ocean bills of lading and commercial invoices are taken up in regular order with a simple treatment of each.

Part II treats of the technique of customs procedure both in the United States and abroad with useful notes to guide the shipper on what to do and what not to do in clearing his incoming or outgoing shipments.

The technique of export packing is covered in Part III with numerous examples illustrative of proper methods to be pursued and dangerous pitfalls to be avoided. Marine insurance and the important question of Financing Export and Import Shipments are treated in Parts IV and V.

In short, the volume furnishes to one interested in foreign trade a picture of the actual handling of export and import shipments in that it clarifies the steps required to be taken after a sale has been made to a foreign customer, or an order has been placed for the purchase of goods abroad. Examples of actual shipments are cited in the book with fac-simile documents met with in ordinary overseas business.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Engineering equipment and supplies, factory furnishings, refrigerator equipment, power transmissions, driving belts, lubricating oils, pipe coverings, etc.—Switzerland. Purchase and agency desired. Reference No. 4510.

Iron sheets for dynamos, iron sheet for transformers, and galvanized-iron sheets—Hungary. Purchase desired. Quotations, c.i.f. Hamburg. Terms: Cash against documents in New York. Reference No. 4512.

Direct connected generator for plant to develop 350 to 500 horsepower, 20 motors from 10 to 75 horsepower, transmission machinery for lumber, a large number of live rolls, a number of trucks, and material for 3 kilns, 20 by 150 feet, inside measurements—Canada. Purchase desired. Quotations, f.o.b. point of shipment. Reference No. 4527.

Woodworking machinery used in the manufacture of umbrellas and parasols—France. Purchase desired. Quotations, c.i.f. French port, in francs. Terms: Cash against documents. Reference No. 4530.

Small tools, steel and copper wire, barbed wire, and general hardware—Australia. Agency desired. Reference No. 4455.

Agricultural machinery of all kinds—Spain. Agency desired. Reference No. 4461.

Machinery for extracting the fiber from flax—Mexico. Agency desired. Correspondence, Spanish. Reference No. 4463.

Machinery specialties, patented metallurgical processes, and metallurgical products—France. Engineer desires representation. Reference No. 4470.

Machinery of all kinds pertaining to the manufacture of linen—Australia. Agency desired. Quotations, f.o.b. New York. Terms: Cash against documents. Reference No. 4473.

Hardware, machinery, and tools—Sweden. Purchase desired. Quotations, c.i.f. Maems or Goteborg. Terms: Cash against documents. Reference No. 4482.

Corrugated iron, structural steel material, wire nails, screws, barbed wire, woven-wire fencing, and automobile accessories—Brazil. Purchase desired. Quotations, c.i.f. Brazilian port. Reference No. 4483.

Any articles used by construction engineers, machine makers, rolling mills, iron founders, and others—England. Agency desired. Reference No. 4486.

Wrought iron and steel pipes and malleable fittings for gas, water and steam pumps and plumbing supplies, such as baths, sinks and lavatories—Norway. Purchase and agency desired. Reference No. 4589.

Hinges, 95 x 55, 110 x 70, 116 x 55, 140 x 70, 160 x 80 and 190 x 80 mm., in packages of 10 or 12—Italy. Purchase desired. Quotations, c.i.f. Palermo. Terms: Cash against documents. Correspondence, Italian or French. Reference No. 4592.

Machinery for a small biscuit making plant and for a soap manufacturing plant—Spain. Purchase desired. Quotations, c.i.f. Spanish port. Terms: Cash against documents. Reference No. 4593.

Machinery for the making of bread, pastry, etc.—Venezuela. Purchase desired. Quotations, c.i.f. Venezuelan port. Correspondence, Spanish or French. Catalogues are requested. Reference No. 4596.

High-speed tool steel, files and drills, to be used in factories, smelters and mines—Poland. Agency desired. Quotations, c.i.f. Danzig. Reference No. 4618.

Machinery to equip a factory for the manufacture of wooden bobbins for textile mills—France. Purchase desired. Reference No. 4607.

Trade Catalogs

Horning and Wiring Presses. The Adriance Machine Works, Inc., 88 Richards St., Brooklyn, N. Y. This company has just issued a new publication of 19 pages, known as Catalog No. 6, illustrating and describing in detail its comprehensive line of horning and wiring presses suitable for manufacturers of tinware, cars, etc. The publication also gives details and illustrations of the company's duplex folding and seaming presses for lock-seamed tinware and for grooving or closing the side seams of round, oval or square cans.

Vanadium Tool Steel. The Colonial Steel Co., Pittsburgh, Pa. The company has just issued a booklet telling the uses, the methods of heat treating, and describing the character of Colonial No. 7 Vanadium tool steel.

Gears. The Boston Gear Works, Norfolk Downs, Quincy, Mass. The company has just issued Catalog No. 41 of 128 pages giving prices, specifications and other information regarding its comprehensive line of gears of all styles carried in stock.

Forges, Blowers, Furnaces, etc. The Buffalo Forge Co., Buffalo, N. Y. A new general catalog (Catalog No. 800) of 180 pages with a complete index has just been issued by this company. The catalog is extensively illustrated with an excellent arrangement and features in detail the company's broad line of forges, hand blowers, post drills, drilling machines, punches and shears—bar cutters, heating furnaces, heating and ventilating apparatus and universal wood cutters.

Power Rotary Shears. The Niagara Machine and Tool Works, Buffalo, N. Y. This company has just issued a new publication known as Bulletin No. 70, covering its line of power rotary shears. It is a twenty-page publication in which are described in detail the various styles of rotary shears with general and detail illustrations, as well as the company's other machinery and tools for sheet metal working. Each machine is accompanied by complete specifications.

Technical Information on Micarta Gears. The Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa. In order to acquaint the industrial gear user with the advantages of Micarta gears, the Westinghouse Electric and Manufacturing Co. has issued a 20 page booklet, Folder 4506, entitled "Salient Facts on Silent Gears." The booklet describes the advantages of the use of Micarta gears and pinions and gives photographs and data describing some of their applications, tables of gear data, etc., enabling the gear user to judge whether or not they are applicable to his machinery.

Metropolitan Subway and Elevated Systems. The General Electric Co., Schenectady, N. Y. The principal characteristics of several great rapid transit systems from an electrical engineering viewpoint are presented in Bulletin 44018 just issued by the General Electric Co. The facilities for power production, transformation, transmission and utilization are outlined briefly for each of the systems in the cities of Boston, Chicago, New York and Philadelphia. The company has taken an important part in the manufacture of various types of apparatus for use on all of these systems. Exhaustive engineering studies and tests have been conducted by engineers to insure to each railway company the selection of exactly the proper equipment for the most reliable and efficient operation.

Modern Piston Specifications. The Modern Electric and Machine Co., Indianapolis, Ind. This company has just issued a publication of 45 pages on modern piston specifications, known as Issue B, in which are given in tabular form, the complete specifications on the company's pistons of all sizes and types for pleasure cars, trucks and tractors.

Borolon. The Abrasive Co., Philadelphia, Pa. The company has just issued a small booklet describing its product "Borolon," a polishing grain for use in all work where emery is now applied. The properties of the article, its method of application and grain size suggestions are embodied in the booklet.

Modern Machine Tools. The Becker Milling Machine Co., Hyde Park, Boston, Mass., and the Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass. The companies named have just issued a catalog listing the land, buildings, modern machine tools, miscellaneous plant equipment, raw materials and supplies which they are offering for immediate sale as a result of the purchase by the Reed-Prentice Co. of the good-will and business of both companies.

Forthcoming Meetings

National Automobile Chamber of Commerce, National Automobile Show, January 27 to February 3, 1923, Coliseum and First Regiment Armory, Chicago, Ill.

American Engineering Council, Annual Meeting, January 11 and 12, at the headquarters of F. A. E. S., 24 Jackson Place, Washington, D. C. L. W. Wallace, Secretary.

American Institute of Electrical Engineers, Mid-Winter Meeting, February 14 to 16. Engineering Societies Bldg., New York. F. L. Hutchinson, Secretary.

Universal Patent Exposition, First Annual Convention and exhibit of patents and inventions, Grand Central Palace, New York City, February 17 to 22, 1923. A. B. Cole, 110 West 40th St., New York City, is chairman.

American Institute of Mining and Metallurgical Engineers, Annual Meeting, February 19 to 21. Engineering Societies' Bldg., New York. F. S. Shartless, Secretary.

American Foundrymen's Association, Annual convention, and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago is secretary.

American Electro Chemical Society, Semi-annual meeting, Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

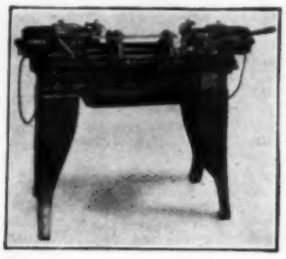
National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society for Testing Materials, Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Centering Machine, Hand, Duplex
Pratt & Whitney Co., 111 Broadway, New York, N. Y.
"American Machinist," November 2, 1922



The machine is equipped with opposed drill heads for centering both ends of the work in one operation, but can be supplied with only one head. Both heads are operated together by a hand lever on the right-hand head. The drill spindles are each driven by a ¼-hp. constant-speed motor at speeds of either 1,200 or 1,800 r.p.m. Adjustable stops determine the depth of drilling. Two quick-acting, self-centering vises take all sizes of work up to 2 in. in diameter, and from 3 to 18 in. long. After the work has been centered, it is deposited in a tote box at the rear. Floor space, 4 ft. 6 in. x 2 ft. 6 in. Weight, 600 pounds.

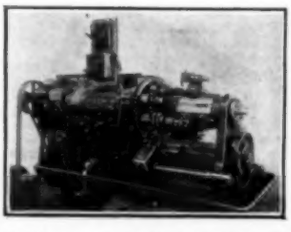
Milling Cutters, Interlocking, "Wiard"
American Standard Tool Works, 402 Owen Bldg., Detroit, Mich.
"American Machinist," November 2, 1922

The cutters are so constructed that they can be used singly or in sets. When more than one is employed, the sides of the teeth of one cutter fit into corresponding grooves in the side of the mating cutter. Cutters can thus be ground in pairs, and when the sides of the teeth become dull the relative positions of the cutters can be changed to bring the opposite sides into play. As the cutters become narrowed by grinding, a pair can be spread apart so as to maintain a given dimension. Individual sections can be used as ordinary milling cutters. The cutters are made in standard sizes for diameter, and of such widths that any standard or special size can be obtained by using the cutters in combination.

Hoist, Electric, "Load Lifter"
Alfred Box & Co., Inc., Philadelphia, Pa.
"American Machinist," November 2, 1922

Although the hoist is only 11 in. wide and 28 in. long, it is made for heavy duty. It can be turned through 90 deg. so as to hang parallel with the rail. The trolley is adjustable to run on I-beams from 5 to 9 in. in size. Hook suspension may be used when the trolley is not required. The hoist is built in one size only, to lift 1,000 lb. on a two-part line at 20 ft. per min., and has a drum which will accommodate nearly 80 ft. of rope. Self-aligning S.K.F. bearings are used in the motor, and Hyatt flexible roller bearings at other points. A multiple-disk load brake and a band brake on the motor shaft are both provided for holding the load in position. All parts are lubricated from one point.

Chucking Machine, Six-Spindle, Horizontal
Baird Machine Co., Bridgeport, Conn.
"American Machinist," November 9, 1922

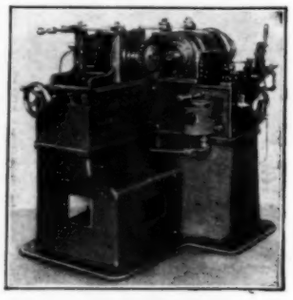


The machine is virtually an automatic lathe for handling five short pieces of work at one time, such as small castings, forgings and bar stock requiring a number of operations such as turning, facing, drilling and threading that can be performed on a lathe. As many as twenty-one cutting tools can be used simultaneously. Separate toolslides are supplied for each working position, with two lengths of feed. There are eight speed changes obtainable by removable gears, and three quick changes of speed, so that twenty-four speeds are available for each spindle. The cutting tools have seventeen changes of feed. Capacity, work up to 6 x 6 in. Spindle speed, from 28½ to 440 r.p.m. Floor space, 93 x 46 in. Weight, 8,500 pounds.

Centering Machine, Automatic, Duplex
Pratt & Whitney Co., 111 Broadway, New York, N. Y.
"American Machinist," November 2, 1922

In this machine, an automatically operated feeding mechanism works in conjunction with a magazine. The work is removed from the magazine by transfer slides, placed in the vise, clamped, centered and then released into the work box. The machine is equipped with opposed drill heads for centering both ends of the work in one operation. The feed of the spindles is operated by the cam operating the transfer slides, and driven by a small motor. Each spindle has a feed movement of from $\frac{7}{16}$ to $\frac{3}{4}$ in. Work from ¼ to 1½ in. in diameter and from 2½ to 18 in. long can be held. Oil is supplied to the drills by a geared pump running at a constant speed. Floor space, 4 ft. 6 in. x 2 ft. 6 in. Weight, 1,020 pounds.

Gear-Testing Machine, Bevel
Davenport Machine Tool Co., Inc., Rochester, N. Y.
"American Machinist," November 2, 1922

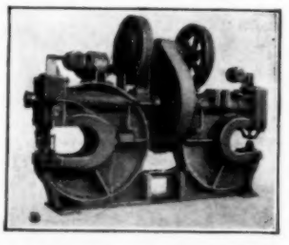


The machine is for subjecting to a running test spiral bevel gears and pinions, tests being made for bearing on the teeth, quietness of running and the center distance at which the best bearing and the least noise occur. One headstock holds the gear and the other the pinion. The pinion is rotated by power and a brake is incorporated to retard the speed of the gear, so that load can be applied. The right-hand headstock is moved back and forth, clamped in position, and the pinion clamped in the spindle by compressed air. The position of the right-hand headstock can be adjusted by the handwheel with a graduated dial located underneath it. Floor space, 4 ft. square. Weight, 1,500 pounds.

Tachometer, Hand
Coats Machine Tool Co., Inc., New York, N. Y.
"American Machinist," November 2, 1922

The hand tachometer is for obtaining a reading directly in revolutions per minute. It is arranged for either three or four ranges of speed for speeds from 30 to 1,600 r.p.m. and can be operated in either direction. Various types of couplings for contact with the shaft, and an extension spindle are provided. A "cutmeter" wheel 6 in. in circumference is employed for obtaining surface speeds. It can be held in contact with a moving surface so that the number of lineal feet of travel per minute can be read on the dial. When the center of the shaft is inaccessible, a thread can be run over a pulley and through the groove on the cutmeter wheel to obtain the circumferential speed. Weight, 1 pound.

Punching and Shearing Machines, Electric-Control, Vertical
Chambersburg Engineering Co., Chambersburg, Pa.
"American Machinist," November 9, 1922



With the electrical control mechanism, the length of stroke and the action of the machine is governed electrically. The mechanism by which the stroke adjustment is made is mounted on the front of the head, and the point at which the stroke will end can be easily predetermined. Depression of the push-button causes the clutch to engage and the head to descend. Two press units can be mounted end to end so that the same motive power can be employed for each. Belt-driven machines without electric control can be furnished. Eight sizes of the machine are made. Smallest size: punching capacity, ½-in. hole through a ½-in. steel plate; throat dimensions, 6, 12, 18 and 24 in. Largest size: capacity, 2½-in. hole through a 1-in. plate; throat depth, 15, 24, 36 and 48 inches.

Clip, paste on 3 x 5-in. cards and file as desired

New and Enlarged Shops

Machine Tools Wanted

Ala., Dothan—Dothan Machine Shop—machine shop equipment.

Calif., San Francisco—Continental Furniture Co., 1636 Bryant St.—double spindle boring machine.

Conn., Bridgeport—J. L. Lucas & Son, Inc., 3 Fox St, (machinery)—four Garvan No. 3 duplex milling machines with 40 in. feed.

Ill., Chicago—Reynolds Equipment Co., Lumber Exch. Bldg.—one 36 in. lathe, bed not less than 14 ft.; one radial drill, 5 to 6 ft.; one planer, 48 in. open sides; one 24 in. shaper; one 100 lb. press.

Ill., Chicago—J. Sidor, 5521 Leland Ave.—one engine lathe, 8 to 11 in. swing.

Mass., Lawrence—Champion-International Co., 38 Prospect St., (paper makers)—equipment for proposed machine shop.

Mass., Roxbury (Boston P. O.)—M. Wolbarst, 77 Waumbeck St.—tools and equipment for garage at 143 Washington St.

Mass., Winthrop—J. C. Murray, 15 Putnam St.—equipment for automobile repair shop.

Minn., Minneapolis—Rohne Electric Co., 2434 25th Ave., S., E. J. Rohne, Purch. Agt.—screw machine and spinning lathe.

Mo., St. Louis — H. B. Schwarz, 3926 Washington Ave.—equipment for automobile repair shop.

Neb., Fairbury—Traum & Lien—machine shop equipment.

N. Y., Brooklyn—B. F. Stephens, 1274 Flatbush Ave. (automobile service station)—screw cutting lathe about 8 in. center, between 6 or 7 ft. bed; also drill press suitable for auto work.

N. Y., Buffalo—J. Myers, 258 Bway.—equipment for service station and automobile repair shop.

N. Y., New York—Delaware, Lackawanna & Western R.R., 90 West St., C. C. Hubbell, Purch. Agt.—one 500 ton single-end car wheel press; two 20 in. heavy duty vertical drilling machines; one Whiton 6 in., 2 spindle centering machine; one Whiton, 4 in. 2 spindle centering machine; one duplex control, motor driven, horizontal-boring, drilling and milling machine, spindle 4 in. diameter; one 48 x 48 in. x 10 ft. planer; two 30 in. x 8 ft. heavy-duty engine lathes; two portable belt lathes, 18 in. swing, 4 ft. between centers; one Warner & Swasey No. 2 universal hexagon turret lathe; one 36 in. Morton draw-cut pillar shaper; two motor driven, double spindle floor grinders, wheel 18 in., 3 in. face; two double spindle sensitive drilling machines, ¼ to ¾ in.; one No. 5 Cincinnati plain milling machine; one double end punch and shear, 40 in. throat; two Chicago steel power bending brakes; three 20 in. engine lathes, two for Buffalo and one for Kingston; one 32 in. shaper; for shops at Kingston, Pa.

O., Youngstown—Federal Iron Wks., 70 Prospect St.—machine to bend angles 4 x 2 x 2 in.

Okla., Okmulgee — Philips Hi-grade Petroleum Co.—machine shop equipment.

Ore., Portland—J. Neelay, 187½ Chester St.—machinist's lathe.

Pa., Boyertown—Eastern Fdry. Co.—machine shop equipment.

Pa., Moores—W. Bozzelle, (contractor and carpenter)—hollow chisel mortiser.

Pa., Pittsburgh—Dusquesne Light Co., 435 6th Ave.—machine tools.

Pa., Pittsburgh—Western Penitentiary, Riverside St., N. S.—list of machine tools.

Tex., Van Alstyne—J. H. Elliott, (repair shop)—electric power lathe and work bench.

W. Va., Logan—Guyan Machine Shops—24 in. shaper vise, 3 to 5 ton trailer, chucks for 22 in. lathes and cylinder grinder for automobile cylinders.

Wis., Cambridge—A. Kiavick—repair machinery, storage tanks and pumps for proposed $45,000 garage on Main St.

Wis., Janesville—W. Alderman, 219 East Milwaukee St.—automobile repair machinery, including drill press.

Wis., Milwaukee—E. Todd, 1117 Kinnickinnie Ave.—drill press and lathe for automobile repair shop.

Wis., Milwaukee—C. W. Valencourt Auto Co., 172 12th St.—electric drilling machine for automobile repair work.

B. C., North Vancouver—J. Crane, 309 East Esplanada St.—machine shop equipment.

Ont., Sarnia—C. McPhee—equipment for garage, to replace that which was destroyed by fire.

Que., Montreal—Quebec, Montreal & Southern Ry. Co., 286 St. James St., N. J. Ferguson, Purch. Agt.—machine and blacksmith shop equipment to replace that which was destroyed by fire, at Sorel.

Machinery Wanted

Ark., Fort Smith—E. Roberts—sausage grinder, cutter, stuffer and lard agitator for power equipment.

Ark., Rumley—Printer—job power printing press, power paper cutter and newspaper cutter (new).

Calif., Fresno—Exide Battery Co., 1347 Van Ness Ave.—additional equipment for battery station.

Calif., Monolith—Monolith Portland Cement Co.—machinery and equipment for the manufacture of portland cement.

Colo., Stonington—News—cylinder newspaper press.

Conn., East Lyme — Niantic Mfg. Co. (manufacturer of cotton goods)—machinery for addition to mill.

Conn., South Norwalk—H. Jacobs & Sons, Day St.—machinery for proposed addition to shoe factory.

Del., Wilmington—J. A. Bader & Co., 923 Market St.—refrigerating machinery for proposed ice manufacturing plant at Clayton.

Fla., Daytona—W. A. Hoffman, Genl. Mgr.—electrically operated machinery and equipment for the manufacture of doors, sash, etc.

Ga., Atlanta — W. H Bradley, Grant Bldg.—one 15 to 25 ton, 8 wheel locomotive crane.

Ga., Brunswick — Overstreet & Son, A. Overstreet, Purch. Agt.—26 x 34 in. job press with power equipment

Ga., Columbus — The Ricco Co. of America, 938 Bar St.—one syrup agitator, one syrup pasteurizer and two or more storage tanks.

Ill., Chicago—Advance Wood Turning Co., 1345 Rawson St.—8 in. ring machine, also a twisting machine.

Ill., Chicago—Alto Mfg. Co., 180 North Cornelia Ave.—36 in. square shear.

Ill., Chicago—E. M. Heller & Co., 144 West Kinzie St.—saw table, good for 10 in. saw, iron top.

Ill., Kewanee—M. L. Koch, 208 Maple Ave.—complete newspaper and job printing equipment.

Ill., Waukegan—Butler Candy Co., 213 South Sheridan Rd.—power operated candy making machinery.

Kan., Wichita—Stevens & Michels, South Water St., (machinery), P. J. Michels, Purch. Agt. — power combination saw (used).

Kan., Wichita — H. J. Underhill, 131 North Emporia St. (planing mill)—woodworking machinery, planer, saw, sander and belting (used preferred).

Ky., Ludlow—Post-Glover Electric Co.—machinery and equipment for the manufacture of electrical devices, to replace that which was destroyed by fire.

Ky., Murray—Johnson & Adams Furniture Co., R. Maddox, Purch. Agt.—complete machinery and equipment for manufacturing, upholstering and repairing furniture for small plant.

Mass., Boston—H. S. Dow, Inc., 35 Newland St.—machinery for new laundry at 70 West Dedham St.

Mass., Conway—Tucker & Cook Woolen Mill, J. F. McDonald, owner—additional machinery for mill.

Mass., Marlboro—Marlboro Dairy Co.—equipment for proposed dairy.

Mass., South Boston (Boston P. O.) — Liberty Marble Co., 80 Granite St.—tools and equipment for the manufacture of marble for new plant at 42 Dillingham St., Boston.

Mass., Waltham—New England Coal Co., Newton St.—elevating and conveying machinery for coaling plant.

Mich., Birmingham—Inter City Bus Line, 207-209 South Woodward Ave.—electric drill; jack shaft and belting; 2 ton chain falls.

Mich., Detroit—Lanza Printing Co., 3133 Rivard St.—pony cylinder press (used).

Mich., Detroit—Michigan Steel Corp., 1708 1st Natl. Bldg.—heavy rolling mills and equipment for proposed steel plant at Ecorse.

Mich., Highland Park (Branch of Detroit)—Ford Motor Co.—coal grinding mills, one kiln with provision for another, slurry tank equipment, 18 in. stocking conveyor, two reclaiming conveyors, slurry pump and rotary coolers for proposed cement factory at River Rouge.

Minn., Wolverton—Hendrickson Bros.—catalogues and prices on machinery for the manufacture of clay brick, blocks and tile. Will be on market about April 1.

Mo., Kansas City—Decker Tin Shop, 111 North Denver St., A. Decker, Purch. Agt.—tinner's press.

Mo., Kirksville—C. C. Howard—complete newspaper equipment.

Mo., Maplewood (St. Louis P. O.)—O. E. Morton, 7421 Manchester Ave.—linotype machine.

Mo., St. Louis—C. A. Axtell, 4400 Easton Ave.—equipment for gasoline filling station on Newstead and Easton Aves.

Mo., St. Louis—St. Louis Southwestern R.R., Railway Exch. Bldg., E. O. Griffin, Asst. to Pres.—machinery for shops at Pine Bluff, Ark. and Tyler, Tex.

Mo., St. Louis—L. Spelbrink, 1321 Franklin Ave., (undertaker)—550 gal. gasoline tank and pump.

Mo., Springfield—North Side Motor Co., 1640 Booneville Ave.—15 to 20 Singer, single needle power sewing machines.

N. Y., Angola—L. L. Brown—ice manufacturing machinery.

N. Y., Buffalo — Central Star Laundry Inc., Main and Northland Ave.—equipment, including one 1,000 gal. gas tank and pump for proposed service station on Northland Ave. and Master St.

N. Y., Buffalo—Holmwood & Holmwood, 328 White Bldg.—equipment, including one 1,000 gal. gas tank and pump for proposed service station on Delaware Ave. and Olive St.

N. Y., Buffalo—C. Johndahl, 169 Allen St.—plumbing shop equipment.

N. Y., Buffalo — W. H. Linford, 2082 Niagara St.—equipment for service station, including one 1,000 gal. gas tank and pump.

N. Y., Buffalo—M. E. Mussen, 10 Fisher St.—equipment for service station, including one 1,000 gal. gas tank and pump.

N. Y., Buffalo — Prene Mfg Co., River Road—machinery and equipment for plant for the manufacture of skid chains.

N. Y., Dundee—W. Fox—machinery for flour and feed mill, to replace that which was destroyed by fire.

N. Y., Hornell—Elmhurst Dairy Co.—pasteurization and milk plant machinery, including machinery for sterilization of bottles.

N. Y., Mayville—Chautauqua Cabinet Co.—woodworking machinery for proposed addition to factory.

N. Y., New York—R. Grant, Woolworth Bldg., (iron and steel broker)—air compressor.

N. Y., New York—Muller MacLean & Co., 195 West St. (machinery agency)—friction saw for cutting pipe.

N. Y., Niagara Falls—Gay Bros.—equipment for bakeshop at LaSalle.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Pig iron firmer in Birmingham and Youngstown districts; slight declines, however, reported in No. 2 foundry iron at Philadelphia, Cincinnati and Chicago. Steel prices, for first quarter, inclined upward; with show of better stability. Bars firm at $2 per 100 lb., Pittsburgh. Improvement in inquiry for structural shapes; $2, uniformly and quite firmly, quoted on all new business. Quotations of $1.90@$1.95, however, frequently apply on large tonnages. Attractive tonnages on new plate business placed at minimum of $1.90@$1.95, with maximum at $2. Demand moderate; confined mostly to car builders.

Electrolytic copper, 14⅛c. as against 14⅛c. per lb. in New York warehouses, one week ago. Coke plates up ⅛c. per lb. in Cleveland. Babbitt metal, best grade, advanced 7c. per lb.; roll sulphur, 5c. per 100 lb. and raw linseed oil 3c. per gal., in New York.

Declines—Downward tendency in black and galvanized steel sheets in Pittsburgh and New York. Tin down ⅛c.; zinc ⅛c. in New York warehouses, during week. Chinese antimony cheaper in Cleveland.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$27.05
Northern Basic	29.27
Southern Ohio No. 2	28.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.44
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	29.14
Virginia No. 2	34.17
Basic	27.50
Grey Forge	28.64
CHICAGO	
No. 2 Foundry local	28.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	29.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.00
Basic	25.00
Bessemer	27.50

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.0
Cincinnati	4.5@6
New York	5.5
Chicago	4@5
Cleveland	5¼@6

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.50	4.19	3.70	4.00
No. 12	2.60	4.24	3.75	4.05
No. 14	2.70	4.29	3.80	4.10
No. 16	2.90	4.39	3.90	4.20
Black				
Nos. 17 and 21.	3.20	4.30	4.20	4.70
Nos. 22 and 24.	3.25	4.35	4.25	4.70
Nos. 25 and 26.	3.30	4.40	4.30	4.75
No. 28	3.35	4.50	4.40	4.85
Galvanized				
Nos. 10 and 11.	3.35	4.50	4.40	4.85
Nos. 12 and 14.	3.45	4.60	4.50	4.95
Nos. 17 and 21.	3.75	4.90	4.80	....
Nos. 22 and 24.	3.90	5.05	4.95	5.40
No. 26	4.05	5.20	5.10	5.55
No. 28	4.35	5.50	5.40	5.90

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	66	54½	⅜ to 1¼	34	19
		LAP WELD			
2	59	47½	2	29	15
2½ to 6	63	51½	2½ to 4	32½	19
7 to 8	60	47½	4½ to 6	32½	19
9 to 12	59	46½	7 to 12	30	17
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	64	53½	⅜ to 1¼	34	20
2 to 3	65	54½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	57	46½	2	30	17
2½ to 4	61	50½	2½ to 4	33	21
4½ to 6	60	49½	4½ to 6	32	20
7 to 8	56	43½	7 to 8	25	13
9 to 12	50	37½	9 to 12	20	8

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	57%	44%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded.	54%	41%	53½%	40½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 6%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.39	3.71	3.90
Cold rolled strip steel	6.75	8.25	7.25
Floor plates	5.50	5.16	5.50
Cold finished shafting or screw	3.90	3.75	3.70
Cold finished flats, squares	4.40	4.25	4.20
Structural shapes (base)	3.14	3.01	3.02½
Soft steel bars (base)	3.04	2.91	2.92½
Soft steel bar shapes (base)	3.04	2.91	2.92½
Soft steel bands (base)	3.84	3.61	3.55
Tank plates (base)	3.14	3.01	3.02½
Bar iron (2.60 at mill)	3.04	2.91	2.92½
Drill rod (from list)	55@60%	40%	50%
Electric welding wire:			
5/32	8.00		12@13
⅛	6.50		11@12
5/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.87½
Tin, 5-ton lots, New York			37.50
Lead (up to carlots), St. Louis	6.90;	New York,	7.45
Zinc (up to carlots), St. Louis	7.20@7.25;	New York,	7.87½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	23.00	23.00
Antimony (Chinese), ton spot	7@7.25	8.37½	7.75
Copper sheets, base	21.50	22.00	23.00
Copper wire (carlots)	16.00	18.00	16.25
Copper bars (ton lots)	20.00	23.00	19.50
Copper tubing (100-lb. lots)	24.75	25.00	23.00
Brass sheets (100-lb. lots)	18.50	20.75	18.75
Brass tubing (100-lb. lots)	23.00	24.00	20.50

—Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	17.00	19.00	15.75
Brass wire (carlots)	19.00	20.75	.....
Zinc sheets (casks)	10.25	10.25	.....
Solder (½ and ¼), (caselots)	27.50	24.75	20.00
Babbitt metal (83% tin)	42.00	47.00	36.00
Babbitt metal (35% tin)	25.00	17.50	.....
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.50	12.00
Copper, heavy, and wire	11.75	11.75	11.50
Copper, light, and bottoms	9.75	10.00	10.50
Lead, heavy	4.75	5.50	5.75
Lead, tea	4.25	4.50	4.75
Brass, heavy	7.00	9.50	9.25
Brass, light	6.00	5.50	6 00
No. 1 yellow brass turnings	6.50	6.50	7.00
Zinc	3 00	4.00	4.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.00	11.50	14.50
IC,	112 sheets	12.30	11.90	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.00	7.25
IC,	14x20	7.25	6.25	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.09@$0.11½	$0.12	$0.11¼
Cotton waste, mixed, per b.	.065@.10	.09	.08
Wiping cloths, 13½x13½, perlb.	.16	32.00 per M	.10
Wiping cloths, 13½x20½, per lb.	.20	48.00 per M	.13
Sal soda, 100 lb. lots	2.80	2.40	2.65
Roll sulphur, per 100 lb	2.90	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.93	1.01	.95
White lead, dry or in oil	100 lb. kegs.	New York, 13.25	
Red lead, dry	100 lb. kegs.	New York, 13.25	
Red lead, in oil	100 lb. kegs.	New York, 14.75	
Fire clay, per 100 lb. bag		.65	
Coke, prompt furnace, Connellsville	per net ton	$6.50@7.00	
Coke, prompt foundry, Connellsville	per net ton	7.50@8.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	40%	50-10-5%	50%
1½ and 1¼x3 in. up to 12 in	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	75%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30%	40–10%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in, per 100 lb. (net)	$6.00	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.00	4.00
Rivets:			
Rivets, ⅞ in. dia. and smaller	45%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1¼ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55–5%	50%	50%
Copper burs	35%	50%	20%
Lard cutting oil (50 gal. bbl.) per gal.	$0.50	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin.ft., $2.88:			
Medium grade	30–10%	40½%	50%
Heavy grade	20–5–2½%	30–5%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40-10%
Second grade	65–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1 24	1.40
Cloth	3.02	2 67	3.20

N. Y., Niagara Falls — A. S. Gilman Printing Co., 623 St. Clair Ave.—printing and conveying machinery.

N. Y., Poughkeepsie—Guilder Eng. Co., Fairview St.—shear to cut light sheets.

N. Y., Rochester—Consolidated Milk Co., 45 Fulton Ave.—pasteurization equipment.

N. Y., Rochester—C. Hans, 171 1st Ave.—one set platform scales.

N. Y., Rochester — West Side Pattern Wks., 197 Lyell Ave.—one small size embossing machine.

N. Y., Syracuse—New Process Gear Co., 500 Plum St., C. R. Burt, Mgr.—about $50,000 worth of gear cutting machinery of all kinds.

N. C., Cary — Bd. Educ. — vocational equipment for new school.

N. C., Wilmington — Carter's Production Works, 210 South Water St., (machinery), O. Carter, Mgr.—one 60 in. veneer clipper; 6 ft. stapling machines; rounders for lettuce basket bottoms and heads and potato barrel heads; hardware for making strawberry crates and lettuce baskets.

O., Archbold—Archbold Ladder Co.—machinery and equipment for the manufacture of ladders.

O., Cincinnati—J. R. Wolf & Co., 216 East Pearl St.—drug packing machine.

O., Cleveland—Republic Structure Iron Wks., East 53rd St. and Lakeside Ave.—1 in. capacity, 96 in. blade and 36 in. throat gate shear.

O., Columbus—Bd. Educ., Tower and High Sts., E. L. McCune, Clk.—receiving bids until Jan. 12, equipment for manual training and laboratory departments of Joseph Sullivan High School.

O., Columbus—D. Davidson, 548 West State St. (job printer)—10 x 15 in. press with belting and full equipment.

O., Columbus—Ohlen-Bishop Co., Ingleside Ave. and Simpson Lane, (manufacturer of saws and tools), L. W. Seymour, Purch. Agt.—general machinery to enlarge factory.

O., Columbus—Union Oilcloth Co., 7th Ave., along tracks of Cleveland, Cincinnati, Chicago & St. Louis Ry., R. H. Wilcox, Purch. Agt.—large generator set and special oil cloth machinery.

O., Dayton—Dixie Boiler Co., 954 Riebold Bldg.—punch, shear, air compressor and bent shear (new or used).

O., Marion—Marion Shovel Co., (steam shovels)—motor driven shear for cutting bars.

O., Portsmouth—W. J. Collum Co.—circular shear.

O., Sandusky—Webster Printing Co.—punching machine.

O., Toledo—E. N. Riddle Co., Bway. and Ottawa St., (manufacturer of lighting fixtures, etc.)—foundry equipment.

O., Wellston—Wellston Mfg. Co. (manufacturer of heating furnaces and specialties), I. Warden, Pres.—machinery and equipment for addition to plant.

Okla., Yahola—Yahola Sand & Gravel Co.—washing and screening machinery.

Ore., Portland—I. Flint, 985 Union Ave. N. (job printing)—13 x 19 in. press for power attachment (used preferred).

Ore., Portland — U. McDonald, Supt. Western Lumber & Door Co., 315 Falling Bldg.—complete line of sash and door machinery for planing mill at Vancouver, Wash.

Pa., Barnesboro—Bd. Educ., Dr. G. F. Anderson, Pres.—equipment for vocational department of new school.

Pa., East Pittsburgh—Westinghouse Electric & Mfg. Co.—one 5 ton crane for Homewood plant.

Pa., Franklin—C. P. Wolfe—machinery and equipment for the manufacture of aluminum products.

Pa., Hazelton—C. H. Rice—sawmill machinery and equipment.

Pa., Manyunk (Phila. P. O.)—Keystone Boiler Wks. (manufacturer of steel and boilers)—½ in. plate rotary bevel shears.

Pa., Minersville—H. W. Keith—machinery and equipment for 500 ton coal washery at Pinegrove.

Pa., Mount Jewett — Safety Sled Co.—machinery and equipment for the manufacture of sleds, to replace that which was destroyed by fire.

Pa., New Castle — Universal Sanitary Mfg. Co., C. J. Kirk, Pres.—special machinery and equipment for pottery manufacturing plant at Cambridge, O.

Pa., Phila.—Brandes Bros., 12th and Brown Sts., (dress bindings, goods, etc.)—doubling and wrapping machine, lightweight type, for folding 50 in. fabrics.

Pa., Phila.—J. J. Brooks, 63rd and Mt. Moriah Ave., (contractor and stone mason)—2 ton traveling crane (power).

Pa., Phila.—Bureau of Water, 792 City Hall—receiving bids until Dec. 29, one 8 wheel locomotive crane, steam operated, 46 ft. steel boom, 1 cu.yd. clamshell bucket, 5,800 lb. capacity.

Pa., Phila.—The city, City Hall, C. E. Davis, Purch. Agt.—two sand filtering, washing and conveying machines, self propelled, electrical, to remove, wash and replace sand in filter beds.

Pa., Phila.—E. Clinton & Co., 2119 Arch St., (manufacturers of brushes)—woodworking machines, drills, sanders, planers, etc., for new factory.

Pa., Phila.—M. Colter, 1220 North 42nd St. (laundry)—extractors, mangles, tubs, etc.

Pa., Phila. — Ellis Glautz & Co., 1210 Race St.—stitcher, pressers and miscellaneous tools for leather working.

Pa., Phila.—Gladstone Knitting Mills, 44 North 3rd St., (knit goods)—latch needle machines and other equipment.

Pa., Phila.—R. M. Greene & Co., 1413 Vine St., (manufacturer of cabinets and soda fixtures), R. M. Greene, Jr., Purch. Agt.—additional woodworking machinery, radial drills, presses, etc., for new factory.

Pa., Phila.—Penn Seaboard Steel Corp., 1417 Sansom St., (castings), G. A. Pedrick, Purch. Agt.—one 9 to 12 ton capacity, double frame steam hammer with pressure of 150 lb. per sq.in.

Pa., Phila.—H. M. and E. B. Siner, Church St. and Tacony Ave., (textiles and dyers)—dyeing machines, dryers, etc., for new plant.

Pa., Phila. — J. M. Tompkins, Belgrade and Orthodox St., (manufacturer of small machine parts and talking machines) — additional equipment and small tools for new plant.

Pa., Phila.—A. Wackerman, 859 Church Lane, (sheet metal works)—brakes and other metal working machines.

Pa., Phila.—J. J. Wilson, 2927 Ellsworth St.—additional equipment for woodworking plant, including planers, tenons, saws and drills.

Pa., Pittsburgh—Guibert Steel Co., 703 Diamond Bank Bldg., S. E. Bachtel, Purch. Agt.—air compressor for steel fabricating work.

Pa., Pittsburgh—Hanlon Gregory Galvanizing Co., 24th St.—monorail system for new plant at 54th and Butler Sts.

Pa., Pittsburgh—Jones & Laughlin Steel Co., 3rd Ave. and Ross St., A. Ochsenhirt, Purch. Agt.—one 15 ton crane for Allquippa works.

Pa., Pittsburgh—Pittsburgh Steel Co., Frick Bldg., H. Llewellyn, Purch. Agt.—tube piercing machinery.

Pa., Reading—R. McCain, Green and Cedar Sts. (hosiery)—several ribbers, Huse or Wildman (used).

Pa., Saint Marys—Elk Graphite Milling Co.—machinery and equipment for the manufacture of graphite products.

Pa., Wampum—Crescent Portland Cement Co.—air compressor.

Pa., Warren—Crew-Levick Co.—oil filter station equipment to replace that which was destroyed by fire.

R. I., Providence—W. B. Dunn Co., Industrial Trust Bldg., (textile spinning)—two twisters, double roll with 2¼ or 2½ in. rings (used).

Tenn., Chattanooga—G. G. Raoul, Pres., West 1st St.—enameling machinery and equipment.

Tenn., Knoxville — Knox Porcelain Co. (manufacturer of porcelain specialties), J. House, Pres.—complete machinery and equipment for plant.

Tenn., Nashville—Federal Can Co., 500 Benton Ave.—machinery and equipment for $20,000 addition to plant.

Tex., Dallas—J. Kirby, 1007 Dale St., (newspaper)—6 x 9 in. power job press.

Tex., Dallas—Paternostro Mfg. Co., 305 South Ervay St., (machine shop)—oxyacetylene welding outfit complete.

Tex., Pioneer—Amer. Oil Co., T. Ryan, Pres., machinery and equipment for proposed refinery.

Tex., Sherman—E. C. Hunter, (newspaper)—6 quarto or 7 folio news press.

Va., Martinsville—Amer. Furniture Co., (manufacturer of bedroom and dining room furniture), A. D. Witten, Pres.—
Jointer.
Clamps, two 36 in. sections.
Two joint glue spreaders.
Two 250 lb. glue kettles.
One vegetable glue spreader.
One 76 in. hydraulic press.
One rip saw with motor.
One 84 in. veneer jointer.
One 80 in. clipper.
One 86 in. x 64 in. dryer.
Two planers (one 36 in. round head), (one 30 in.—3 knife sq. head).
Jointer, 18 in.
Three No. 5 cutoff saws.
Four dry kilns, 110 ft. long, 80 ft. wide, end piling.
Lumber lifts.
Rip saws, No. 15.
Molders, No. 35 (one No. 6 and one No. 12).
Tenon machine, double end.
Tenon machine, single end.
Endless bed sander, triple drum.
Band saw, 25 N. P. motor.
Filing room equipment, including tension roll for 6 in. band saw, grinder and knife grinder.
Sidney lathe, 20 in. swing.
Jointer, 12 in.
Double trim saw.
Dovetail machine.
Dovetail machine, 12 spindle.
Two 42 in. band saws.
One jig saw.
Mitre saw.
Lathe.
One shaper.
Two buss shapers.
Variety saw.
Six-spindle boring machine.
Mortice machine, 5 spindle.
Sander, (disc and jig).
Sander, variety.
All belt sanders, including oscillating, No. 274, 3 overhead and 1 underneath.
6 in. jointer.
Double drum sander.
Cabinet benches.
Bow end bed clamp.
One No. 273 sander.
One case clamp.
One handy end clamp.
Electric glue pots.

Va., Richmond—Hackley Morrison Co., Inc., 1708-22 Lewis St., (machinery), G. W. Booth, Purch. Agt.—one 100 ton track scale, standard gauge; one ¾ yd. caterpillar tread steam shovel; two 3⅛ x 16 x 52 in. cast split pulleys, extra heavy, with key way and set screws.

Va., Wytheville—R. P. Johnson (machinery dealer), O. M. Johnson, Purch. Agt.—portable gasoline engine drive air compressor outfit, about 100 cu.ft. free air per minute (used); ¾ yd. steam shovel, caterpillar tread.

Wash., College Place—Walla-Walla College—power press for printing college paper.

W. Va., Charleston—Tire Gauge Valve Co., H. D. Everett, Pres.—machinery and equipment for the manufacture of tire valves.

W. Va., Clifton—Clifton Coal Co.—coal tipple machinery, also conveying and handling equipment.

W. Va., New Cumberland — Hancock County Bd. Educ.—vocational equipment for $180,000 school at Weirton.

W. Va., Parkersburg—Blackwood Electric Steel Corp.—annealing furnaces, traveling crane, electric welders, air compressors, acetylene generator and grinders.

Wis., Chippewa Falls—Northern Supply Co. (telegraph and telephone supplies), J. M. Bischell, Mgr.—woodworking machinery and special machinery for the manufacture of poles, brackets, etc.

Wis., Green Bay — Flidex Corp. of America (manufacturer of filing cabinet devices), J. Kabat, Secy.s—pecial equipment and machinery, including precision tools.

Wis., Green Bay—Press Gazette, 315 Cherry St.—steel equipment and new press for proposed newspaper plant.

Wis., Madison—Piper Bros., 31 North Pinckney St.—refrigeration machinery.

Wis., Madison—M. Sommers, 512 West Wilson St.—refrigeration machinery.

Wis., Milwaukee—Luxknit Sweater Mills Co., 685 3rd St., P. E. Yolles, Purch. Agt.—power knitting machines.

Wis., Milwaukee—O. F. Pfeil, 2017 Clybourn St., (metal specialties)—nickle plating equipment and shafting.

Wis., Milwaukee—South Side Buick Co., 916 Forest Home Ave., J. A. Piszczek, Purch Agt.—presses, gas storage tank and pump.

Wis., Racine—R. R. Adams, 1010 13th St. (dairy)—ice making machinery, approximately 40 ton capacity.

Wis., Ripon—A. E. Wells—creamery equipment, including power churns, belting and shafting.

Wis., St. Francis—J. Handle, Station D, Route 1, (carpentry and millwork)—mortiser (used preferred).

Wis., Whitehall—E. F. Rotering (quarry)—crushing machinery.

Wis., Wisconsin Rapids—Arpin Process Coke Co., c/o J. B. Arpin—special machinery and equipment for the manufacture of coke.

B. C., Prince George—Aleza Lake Sawmill Co.—sawmill equipment.

N. S., Windsor—Nova Scotia Textiles, Ltd., (knit goods) — calender machine (used).

Ont., Alexandria — Alexandria Woolen Mills, Ltd., D. A. MacDonald, Pres.—two 108 in. blanket looms; one fancy loom with 25 sets harners or more; one automatic spinning mule; one bobbin winder to wind from the small bobbins as they come from the mule on to the bobbins to be used in the shuttles for the looms.

Ont., Arnprior—E. McKinney—cold storage and refrigeration machinery and equipment.

Ont., Hamilton — Ontario Shale Brick Co., Sun Life Bldg.—equipment for proposed plant.

Ont., Hamilton—Zimmerman Reliance Knitting Co.—$30,000 worth of additional equipment.

Ont., Milverton—West Window Regulator Co., E. H. Gropp, Mgr.—special metal working tools and machinery for the manufacture of patent auto window regulator.

Ont., Petrolea—Canadian Oil Co., C. A. Hale, Mgr.—equipment to replace that which was destroyed by fire.

Que., Montreal—Acme Trading Co., 205 St. James St., (pulp and paper), A. Ellison, Purch. Agt.—machinery for ground wood mill.

Que., Terrebonne — Limoge & Co., W. Limoge, Purch. Agt.—sash and door factory equipment, also woodworking and sawmill machinery.

Metal Working Shops

Calif., Berkeley—J. Havens, c/o J. W. Plachek, Archt., 2014 Shattuck Ave., is having plans prepared for the construction of a 1 story garage on Shattuck Ave. Cost will exceed $50,000.

Calif., Fresno—U. G. Hayden, Rowell Bldg., plans to build a 2 story battery station on Van Ness Ave. Estimated cost $20,000. Exide Battery Co., 1347 Van Ness Ave., lessee.

Calif., Fresno—The Herminghaus Estate plans to build a 1 story, 125 x 150 ft. garage on L St. between Merced and Tuolumne Sts. Estimated cost $40,000. Architect not selected. Waterman Bros., Tulare and L Sts., lessees.

Calif., San Francisco—G. Hackett, 247 Powell St., is having plans prepared for the construction of a 2 story (ultimately 6 story) garage and store building, on Ellis St., near Taylor St. Estimated cost $50,000. O'Brien Bros., Inc., 240 Montgomery St., Archts.

Calif., San Francisco — The Stevenson Garage, Inc., c/o A. S. Bugbee, Archt., 26 Montgomery St., is having plans prepared for the construction of a 2 story, 130 x 150 ft. garage on Stevenson St.

Ill., Chicago—R. F. France, Archt., 155 North Clark St., is receiving bids for the construction of a 1 story, 106 x 135 ft. garage on Juneway Terrace near Clark St., for F. J. Fadner, c/o Architect. Estimated cost $125,000.

Ky., Louisville—The Louisville Garage is having plans prepared for the construction of a 2 story, 150 x 200 ft. garage on 5th Ave. Estimated cost $225,000. Murphy & Bros., Louisville Trust Bldg., Archts. Noted Dec. 14.

Ky., Ludlow—The Post-Glover Electric Co. plans to rebuild its factory for the manufacture of electrical devices, which was destroyed by fire. Estimated cost $25,000. Architect not announced.

Mass., Cambridge—The Ford Motor Co., Highland Park, Detroit, Mich., is having preliminary sketches made for the construction of a 3 story assembly plant with power house, here. Estimated cost $300,000. A. Kahn, 1000 Marquette Bldg., Detroit, Archt.

Mass., Holyoke—P. F. Donaghue, Walnut St., awarded the contract for the construction of a 2 story garage. Estimated cost $75,000.

Mass., Lawrence — The Champion-International Co., 38 Prospect St., paper makers, will build a 1 story, 65 x 115 ft. machine shop on Canal and Gorden Sts. Estimated cost $30,000. Noted Oct. 19.

Mich., Ecorse—The Michigan Steel Corp., 1708 1st Natl. Bldg., Detroit, has had plans prepared for the construction of six 1 story mills for the manufacture of sheet steel, on Rouge River, here. Estimated cost $1,000,000. Private plans.

Mo., Kansas City—Holbert & Perrin, 23rd and Grand Sts., awarded the contract for the construction of a 2 story, 75 x 100 ft. garage on Armour Blvd. Estimated cost $42,000.

Mo., St. Louis—The Haynes-Langenberg Mfg. Co., 4045 Forest Park Blvd., awarded the contract for concrete work of 3 story, 150 x 200 ft. furnace factory on Bircher St. near Euclid Ave. Estimated cost $100,000. Noted Dec. 7.

Mo., St. Louis—The United Shoe Mchy. Corp., Albany Bldg., Boston, Mass., is having plans prepared for the construction of a 3 story, 125 x 190 ft. addition to its factory, for the manufacture of tacks and nails, at 4045 Forest Park Blvd., here. Architect not announced.

N. Y., New York—R. Jacobs, c/o R. H. Almiroty, Archt., 48 West 46th St., will soon receive bids for the construction of a 2 story, 100 x 100 ft. garage at 31 West 65th St. Estimated cost $50,000.

N. Y., Rochester — The Rochester Vulcanite Pavement Co., Sherman Pl., plans to build an addition to its plant, for the repair of machinery. Estimated cost $5,000. Architect not announced.

N. Y., Syracuse—Mills, Rhines, Bellman & Nordhoff, Archts., 1234 Ohio Bldg., Toledo, Ohio, are receiving bids for the construction of a 2 story, 100 x 250 ft. factory for the manufacture of gears for the New Process Gear Co., 500 Plum St., here. Estimated cost $150,000. C. R. Burt, Mgr.

O., Chillicothe—The Quartermaster General, Office War Dept., Wash. ,D. C., awarded the contract for the construction of a U. S. Veteran's Hospital, including garage and shop, and vocational shop, here. Estimated cost $1,497,000.

O., Cleveland—L. A. Lux Co., 2183 Scranton Rd. (boiler compound), awarded the contract for the construction of a 1 story, 40 x 80 ft. factory. Estimated cost $10,000. L. A. Lux, Pres.

O., Youngstown—The Brier Hill Steel Co., Stambaugh Bldg., plans to build a strip steel mill. Architect not announced.

Pa., Aspinwall (Pittsburgh P. O.)—Humes Bros., Brilliant St., awarded the contract for the construction of a 1 story addition to garage. Estimated cost $40,000.

Pa., Freedom — Freedom Oil Wks. awarded the contract for the construction of a 2 story, 48 x 75 ft. garage and repair shop addition to its plant. Estimated cost $40,000. Noted Aug. 3.

Pa., Lancaster—The Champion Blower & Forge Co. plans to build a 1 story, 60 x 145 ft. addition to its plant, to be used as an assembling department. Estimated cost $25,000. Architect not announced.

Pa., Leechburg—The West Leechburg Steel Co., Farmers Bank Bldg., Pittsburgh, awarded the contract for the construction of a 1 story, 120 x 700 ft. addition to its strip mill, here. Estimated cost $1,500,000.

Pa., Phila.—S. B. and B. W. Fletcher, 25th and Reed Sts., plan to build a 1 story, 60 x 160 ft. garage on 26th and Wharton Sts. Estimated cost $70,000. Stuckert & Co., Crozier Bldg., Archts.

Pa., Phila.—W. Smedley, Archt., Stephen Girard Bldg., is receiving bids for the construction of a 3 story, 102 x 104 ft. garage and repair shop at 223-27 Lombard St., for the Abbotts Dairy Co., c/o E. R. Linebach, 31st and Chestnut Sts. Estimated cost $150,000.

Pa., Pittsburgh—The Chatham Land Co., c/o H. D. Shawkey Motor Co., 5526 Penn Ave., awarded the contract for the construction of a 1 story, 100 x 200 ft. service and repair station on Penn Ave. and Pacific St. Estimated cost $60,000.

Pa., Pittsburgh—The Metal & Thermite Corp., 1201 Bway., New York City, awarded the contract for the construction of a 2 story, 40 x 100 ft. shop and storage building on Fayette St., here. Estimated cost $60,000. Noted Nov. 23.

Pa., Pittsburgh—The Natl. Metal Products Co., Erie and Diamond Sts., will build a 1 story, 68 x 138 ft. factory on Chateau and Fayette Sts. Estimated cost $60,000.

Pa., Pittsburgh — The Studebaker Sales Co., 4724 Baum Blvd., awarded the contract for the construction of a 2 story, 87 x 112 ft. addition to its garage and sales room. Estimated cost $65,000. Noted Nov. 16.

Pa., Pittsburgh—The Van Vleck Motor Car Co., 420 North Craig St., will soon award the contract for the construction of a 3 story, 91 x 115 ft. automobile sales and service station on Baum Blvd. and Commerce Way. Estimated cost $125,000. E. P. Mellon, 350 Madison Ave., New York City, Archt.

Pa., Wilkinsburg (Pittsburgh P. O.)—C. C. McKallip, Magee Bldg., Pittsburgh, is receiving bids for the construction of a 2 story, 50 x 90 ft. sales room and garage on Penn Ave., here. Estimated cost $50,000. Private plans.

R. I., East Providence—The United Electric Rys. Co., Providence, is receiving bids for the construction of a 1 and 2 story, 170 x 535 ft. car house and repair shop on North Bway, here. Estimated cost $400,000. Private plans.

W. Va., Warwood (Wheeling P. O.)—The Centre Fdry. and Machine Co. awarded the contract for the construction of a 1 story, 100 x 320 ft. foundry and machine shop. Cost will exceed $60,000.

Wis., Cambridge—A. Kiavick plans to build a 1 and 2 story, 50 x 90 ft. garage, repair shop and filling station on Main St. Estimated cost $45,000. Architect not selected.

Wis., Sheboygan Falls—The Falls Motor Corp. is receiving bids for the construction of a 1 story, 50 x 60 ft. factory for the manufacture of motors.

Wis., Stratford—G. Chrouser plans to build a 2 story, 60 x 100 ft. garage and repair shop. Estimated cost $40,000. Architect not selected.

Wis., Waukesha—The Spring City Auto Co., 220 West Main St., awarded the contract for the construction of a 1 story, 65 x 190 ft. garage. Estimated cost $40,000. Noted Dec. 7.

Ont., Mount Dennis — The Electroplax Mfg. Co. plans to rebuild its electro plating factory which was recently destroyed by fire. Estimated cost $100,000.

Ont., Toronto—C. Pearce, 100 Inglewood Dr., plans to build a 1 story, 40 x 120 ft. garage. Estimated cost $25,000.

General Manufacturing

Ala., Montgomery—The Atlantic Ice & Coal Co., Perry St., awarded the contract for the construction of a 101 x 220 ft. ice and cold storage plant. Estimated cost $300,000.

Calif., Berkeley—L. W. Hink, 2226 Atherton St., is having plans prepared for the construction of a 2 story garage and printing plant. Estimated cost $15,000. J. W. Plachek, 2014 Shattuck Ave., Archt.

Calif., Emeryville—The Paraffine Co.'s, Inc., 34 1st St., San Francisco, manufacturer of box board, roofing, wall board and floor coverings, has purchased a 40 acre site, here, and plans to build extensions to its plant.

Calif., San Francisco — The California Shade Cloth Co., Inc., 2183 Bryant St., has had plans prepared for the construction of a 2 story, 40 x 200 ft. factory on San Bruno Ave. near Costa St. Estimated cost $35,000. Private plans.

Calif., San Francisco—Roth, Winter & Walsh, 1271 Mission St., pork packers, have had plans prepared for the construction of a 2 story, 92 x 120 ft. packing plant on Townsend St. near 5th St. Ward & Blohme, 454 California St., Archts.

Calif., Stockton—The Natl. Paper Products Co., Church St., between McDougall and Stockton Sts., awarded the contract for the construction of an addition to its paper mill. Cost between $100,000 and $150,000.

Conn., South Norwalk—H. Jacobs & Sons, Day St., are receiving bids for the construction of a 2 story, 60 x 120 ft. addition to shoe factory. Estimated cost $40,000. A. S. Meloy, 2965 Main St., Stratford, Archt.

Conn., Waterbury—R. F. Worden & Sons, Cherry St., awarded the contract for the construction of a 3 story, 40 x 45 ft. addition to their factory, for the manufacture of novelties. Estimated cost $25,000.

Conn., Westport — Lees Mfg. Co., 320 Bway., New York City, awarded the contract for the construction of a 3 story, 50 x 150 ft. addition to its cordage and twine factory, here. Estimated cost $75,000. Noted Dec. 14.

Del., Clayton—J. A. Bader & Co., 923 Market St., Wilmington, awarded the contract for the construction of a 1 story, 75 x 100 ft. ice manufacturing plant, here. Estimated cost $30,000.

Idaho, Weippe—E. T. Chapin Co., Symons Bldg., Spokane, Wash., manufacturer of poles, will receive bids in the spring for the construction of a sawmill, here. Estimated cost $100,000.

Ill., Chicago—The Advertising Art Bulletin Co., 190 North State St., is having plans prepared for the construction of a 1 and 2 story, 163 x 239 ft. factory on Ravenswood St. near Peterson St. Estimated cost $100,000. A. H. Knox, 7 West Madison St., Archt.

Ill., Chicago—The Evans Fibre Box Co., 3261 West 47th St., awarded the contract for the construction of a 1 and 2 story, 101 x 483 ft. factory at 4734-60 South Spaulding Ave. Estimated cost $150,000.

Ill., Chicago — The E. L. Mansure Co., 1601 Indiana Ave., manufacturer of draperies and trimmings, plans to build an 8 story factory and office building. Estimated cost $2,000,000. Architect's name withheld.

Ill., Dixon—O. Beyer, Hennepin and 1st Sts., will soon receive bids for the construction of a 1 and 2 story, 79 x 140 ft. bakery. Estimated cost $90,000. R. Griesser, 64 West Randolph St., Archt.

Ill., Taylorville—The Hopper Paper Co. is receiving bids during December for the construction of a 2 story, 80 x 160 ft. addition to its factory. Estimated cost $60,000. Billingham & Cobb, 404 Press Bldg., Kalamazoo, Mich., Archts.

Ind., Fort Wayne — The Fort Wayne Dairy Co., 449 Baker St., awarded the contract for the construction of a 2 story dairy. Estimated cost $50,000.

Ind., Fort Wayne—The Standard Lumber & Supply Co., Leesburg Rd., is having plans prepared for the construction of a 2 story, 50 x 100 ft. planing mill and garage. Estimated cost $25,000. Private plans.

Kan., Wichita—The Jacob Dodd Packing Co., 21st St. and Lawrence Ave., awarded the contract for the construction of a refrigeration plant. Estimated cost $100,000.

Kan., Wichita — L. A. Watkins, North Waco St., will soon receive bids for the construction of a 1 story, 50 x 140 ft. planing mill. Estimated cost $12,000. U. G. Charles, 2601 Schweiter Bldg., Engr. and Archt.

Ky., Louisville — A. Loomis, Archt., 51 Todd Bldg., will receive bids in the spring for the construction of a 3 story, 100 x 220 ft. printing plant on 9th St. and Bway. for the Gibbs-Inman Co., 825 West Bway. Estimated cost $100,000.

Mass., Bridgewater—L. Q. White Shoe Co. is having plans prepared for the construction of a 5 story, 40 x 300 ft. factory. Estimated cost $50,000. Architect not announced.

Mass., Clinton—Roubaix Mills, Inc., 792 Main St., awarded the contract for the construction of a 2 and 3 story dyehouse, to contain 15,000 sq.ft. of floor space on Main St. Estimated cost $50,000.

Mass., Great Barrington — The Dairymen's League Co-operative Association plans to build a 2 story dairy. Estimated cost $50,000. Architect not announced.

Mass., Marlboro — The Marlboro Dairy Co. awarded the contract for the construction of a 2 story, 50 x 60 ft. dairy on East Main St. Estimated cost $50,000.

Mass., Quincy (Boston P. O.)—Brooks-Skinner Co., Inc., Quincy Point, will build a 1 story, 100 x 242 ft. factory for the manufacture of portable buildings, here. Estimated cost $50,000.

Mass., Roxbury (Boston P. O.) — The Armstrong Knitting Mills, 99 Chauncy St., awarded the contract for the construction of a 2 story, 40 x 60 ft. addition to knitting mill, here. Estimated cost $15,000.

Mass., South Boston — The New York, New Haven & Hartford R.R. Co., South Station, Boston, awarded the contract for the construction of a 1 story roundhouse, etc., on Dorchester Ave., here. Estimated cost $75,000.

Mass., Spencer—The Spencer Gas Co., 110 Main St., will alter and build a 1 story addition to its gas plant on Elm St. Cost between $40,000 and $50,000.

Mass., Stoneham—The J. J. Grover Sons Co., Main St., will build a 4 story, 40 x 80 ft. addition to its shoe factory. Estimated cost $40,000.

Mass., Waltham—The New England Coal Co., Newton St., will build a coaling plant. Estimated cost $25,000.

Mich., Petoskey—The Petoskey Portland Cement Co. is having preliminary plans prepared for extending factory, stock house and power plant. Estimated cost $500,000. J. C. Buckbee, 1st Natl. Bank Bldg., Chicago, Engr. This corrects report in Dec. 7 issue.

Mich., River Rouge—Ford Motor Co., Highland Park, awarded the contract for the construction of a 260 x 365 ft. plate glass and gas producer plant, here. Estimated cost $1,500,000.

Mich., River Rouge (Branch of Detroit) —A. Kahn, Engr. and Archt., 1000 Marquette Bldg., Detroit, is receiving bids and will open same about Dec. 29 for the construction of a 1 and 2 story, 150 x 300 ft. cement plant, including conveyor runway in open clinker storage adjoining coal grinding and calcining building, and 10 silo storage bins for bulk cement, 24 ft. in diameter, here, for the Ford Motor Co., Highland Park, (Branch of Detroit).

Minn., Hibbing—The Members of Village Council will soon award the contract for the construction of a 1 story, 65 x 65 ft. gas works. Estimated cost $30,000. C. Foster, 512 Sellwood Bldg., Duluth, Engr. and Archt.

Mo., Kansas City—Hall Bros. Co., 1114 Grand Ave., manufacturer of stationery, etc., awarded the contract for the construction of a 5 story, 100 x 115 ft. plant on 26th and Walnut Sts. Estimated cost $1,250,000.

Mo., Kansas City—The Kansas City Oxygen Gas Co., 1805 Grand Ave., is having plans prepared for the construction of a 2 story, 18 x 48 ft. factory on 13th and Easton Sts. Estimated cost $25,000. Private plans.

Mo., St. Louis—The Grace Sign Mfg. Co., 425 South Main St., awarded the contract for the construction of a 1 story, 162 x 260 ft. sign factory on President and 2nd Sts. Estimated cost $100,000. Noted Dec. 14.

N. J., Camden—H. Kohnstamm & Co., Cleveland and Lois Sts., plan to build a 1 story, 65 x 74 ft. factory for the manufacture of laundry supplies. Estimated cost $18,000. Private plans.

N. J., Trenton—The New Jersey Porcelain Co., New York Ave. and Mulberry St., plans to build a plant. Architect not selected.

N. J., Trenton — The Trenton Potteries Co. will build a 1 story, 50 x 150 ft. kiln building at the Equitable Pottery plant on Lalor and Hancock Sts. Estimated cost $10,000.

N. J., West Berlin—Baccelleri Bros., 924 South 11th St., is receiving bids for the construction of a 1 story, 50 x 150 ft. furniture factory. Estimated cost $35,000. Private plans.

N. Y., Buffalo—The Culliton Ice Cream Co., 172 Guilford St., has had plans prepared for the construction of a 20 x 65 x 80 ft. ice plant, a 15 x 30 x 65 ft. engine room and a 12 x 30 x 60 ft. ice storage building on East Jewett Ave. Cost will exceed $25,000. Architect's name withheld.

N. Y., Buffalo—Kittinger Bros., 1893 Elmwood Ave., plans to build a large addition to furniture factory. Estimated cost $40,000. Architect not announced.

N. Y., Buffalo—The Quality Damp Wash Co., Inc., Northland Ave. and Chelsea St., plans to build a 1 story, 80 x 100 ft. laundry. Architect not announced.

N. Y., Buffalo—The Sinclair Oil Co., Washington St., plans to rebuild major portion of its gasoline and oil plant on Alabama St., which was destroyed by fire. Estimated cost $100,000. Architect not announced.

N. Y., Cohocton—The Wetmiller Dairy & Farm Products Co. awarded the contract for the construction of a 2 story, 44 x 44 ft. dairy.

N. Y., Dundee—W. Fox plans to rebuild flour and feed mill on Vine St. which was destroyed by fire. Estimated cost $5,000. Architect not announced.

N. Y., Hornell—The Elmhurst Dairy Co. plans to build a creamery on Erie Ave. Estimated cost $10,000. Architect not announced.

N. Y., Jamestown — The Jamestown Worsted Mills Co. awarded the contract for the construction of factory No. 16, 4 story, 70 x 180 ft. Estimated cost $250,000. Noted Nov. 16.

N. Y., Mayville—The Chautauqua Cabinet Co. plans to build an addition to its factory for the manufacture of wooden cabinets. Cost will exceed $6,000. Architect not announced.

N. Y., Niagara Falls—The A. S. Gilman Printinfi Co., 623 St. Clair Ave., awarded the contract for the construction of a 1 story, 100 x 200 ft. printing plant.

N. Y., Rochester—The Empire State Ice Co., 76 West Monroe St., Chicago, has had plans prepared for the construction of a 48 x 182 ft. and 67 x 133 ft. ice plant on Atlantic Ave., here. Estimated cost $300,000. Private plans.

N. Y., Tonawanda—The American Kardex Co., Main St., is having plans prepared for the construction of a 2 story, 50 x 160 ft. addition to its plant. Estimated cost $70,000. L. Eggert, 35 Elmwood Ave., Archt.

N. C., Gastonia—H. H. Groves will soon award the contract for the construction of a cotton mill for the manufacture of fine combed yarns, capacity 15,000 spindles.

N. C., Whitnel—The Nelson Cotton Mill Co., Lenoir, plans to build a 6,000 spindle cotton mill, here.

O., Cleveland—Donley Bros., Co., East 74th St. and Aetna Rd., (building specialties) plans to build a 1 story factory on East 138th St. and Miles Ave. Estimated cost $50,000. G. Donley, Mgr. Architect not selected.

O., Cleveland—The Double Eagle Bottling Co., 6517 St. Clair Ave., awarded the contract for the construction of a 2 story, 30 x 60 ft. bottling works. Estimated cost $40,000. J. Potokar, Mgr. Noted Nov. 16.

O., Cleveland—Fischer & Jirouch, 4821 Superior Ave., awarded the contract for the construction of a 3 story, 60 x 73 ft. addition to plastic works. Estimated cost $40,000.

Ore., Medford — W. E. Sterns plans to build a cold storage plant.

Ore., Portland—The See-Der Mfg. Co., Larabee and Delay Sts., plans to build a factory for the manufacture of cedar chests, furniture and wood novelties. Estimated cost $25,000.

Pa., Allentown—The Independent Oil Co., Inc., Rialto Bldg., plans to rebuild its oil plant on 12th St., which was destroyed by fire. Cost between $60,000 and $75,000. Architect not announced.

Pa., Johnstown — The Edward Hahn Packing Co., Hickory St., awarded the contract for the construction of a 3 story, 48 x 108 ft. and 24 x 112 ft. addition to its packing plant. Estimated cost $65,000. Noted Dec. 7.

Pa., Pittsburgh—The Ward Baking Co., Southern Blvd. and St. Marys St., New York City, will soon award the contract for the construction of a 1 story, 141 x 194 ft. addition to its bakery on Penn Ave., Beechwood Blvd. and Shakespeare Alley, here. Estimated cost $100,000. C. B. Comstock, 110-112 West 40th St., New York City, Archt.

Pa., Tullytown — The Megargee Paper Mills, 16 South 6th St., Phila., will not build a paper plant, here, as stated in issue of Dec. 7.

Pa., Wilkes-Barre — A. Hildebrand, 91 Wood St., plans to rebuild planing and lumber mill which was destroyed by fire. Estimated cost $45,000. Architect not announced.

Wash., Hoquiam — The Grays Harbor Home Building Corp. is building a plant for the manufacture of ready cut homes and buildings. C. Kane, Secy.

Wis., Cedar Grove — The Cedar Grove Shoe Mfg. Co. plans to build a 2 story, 50 x 95 ft. shoe factory. M. J. De Master, Pres. Architect not selected.

Wis., Green Bay—The Northern Paper Mills, Day St., manufacturer of machinery to bark logs, will build a 1 story, 40 x 100 ft. barker room. Estimated cost $12,000.

Wis., La Crosse—The Art Glass Co., 123 South Front St., awarded the contract for the construction of a 1 story, 40 x 100 ft. factory for the manufacture of art glass, on South 3rd St. Estimated cost $25,000. F. H. Flemmer, Mgr.

Wis., Madison — Heilprin & Co., West Mifflin St., is having plans prepared for the construction of a 2 story, 75 x 150 ft. cold storage warehouse on Bedford St. Estimated cost $90,000. J. Heilprin, Pres. E. A. Tough, Conklin Bldg., Archt. Noted Nov. 30.

Wis., Milwaukee—H. J. Esser, Archt., 82 Wisconsin St., is receiving bids for the construction of a 2 story, 85 x 150 ft. dairy on 11th St. for the Cedarburg Dairy Co., c/o H. Berns, 1586 Prospect Ave. Estimated cost $75,000. Noted Nov. 30.

Wis., Milwaukee—The Harsh & Chapline Shoe Co., 694 Hanover St., awarded the contract for the construction of a 3 story, 60 x 210 ft. factory. Estimated cost $110,000. Noted Nov. 30.

Wis., Sheboygan—The city is receiving bids for the construction of a 2 story, 76 x 108 ft. tool, carpenter and woodworking shop, on South Water St. Estimated cost $40,000. J. Steimle, Clk. A. A. Nack, City Hall, Archt.

Wis., Sturgeon Bay—The Door County Fruit Growers Union plans to build a cold storage plant and a dehydrating plant for drying apples. Estimated cost $50,000. E. L. Johnson, Mgr. Architect not selected.